HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PESTICIDES PROGRAMS

DIVISION OF PESTICIDE COMMUNITY STUDIES
S. W. Simmons, *Director*
4770 Buford Highway, Bldg. 29
Chamblee, Georgia 30341

HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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72-1354. Anonymous. **Agricultural aviation in Israel.** *Agr. Aviat. 13(4): 119-122; 1971.* (2 references)

The agricultural use of aircraft in Israel has been increasing at the rate of about 10% per year. Pilots of these aircraft must have a commercial license and an agricultural rating which demonstrates a knowledge of pesticides. Total flight time is limited to 800 hrs/yr and pilots must undergo medical tests at 6-mo intervals. During organophosphate spraying, frequent blood cholinesterase tests are required. Due to weather conditions aircraft utilization has been and will probably remain at approximately 600 hr/yr, though successful night trial flights would considerably increase utilization. In general, the conventional boom and nozzle dispensing is used, and evidence that the system gives proper droplet size and spray distribution is required. To insure safe spraying of certain chemicals, minimum distances from populated areas (120 m) and citrus plantations (200 m) have been set. A permit is required for use of 2,4-D, 2,4,5-T, dalapon, Amitril, Gramoxone (paraquat), Reglone (diquat), and Tordon (picloram). Treatments for specific pests include: ULV application at 1 l./ha containing 250 cc of malathion LV and 750 cc Protein-Hydrolyzate bait against fruit flies; and dusting of 70% sulfur dust against mildew at 3 to 4 kg/ha in apples.

72-1355. Epstein, S. S. (Case Western Reserve U. Medical School, Cleveland, OH 44106). **Environmental pathology.** *Amer. J. Pathol. 66(2): 352-373; 1972.* (35 references)

Chemical pollutants are evaluated in terms of the adverse effects they produce in human beings. Pollutants are classified as: natural chemicals present in excess (e.g., nitrates); natural fungal or plant toxins (e.g., aflatoxins) in crops; complex organic and inorganic mixtures (e.g., air and water pollutants); and synthetic chemicals (e.g., pesticides). Their effects may be characterized as acute or chronic toxicity (the latter including carcinogenicity, teratogenicity and mutagenicity). Pesticides, in the form of the chemosterilant insecticides, are specifically noted. These are derived from ethyleneimines (aziridines), known to be highly mutagenic chemicals. In toxicity testing, there is a need for refinement in methodology. This is illustrated by the recent demonstration that a large number of factors such as stress, crowding, food deprivation, and parturition can increase DDT toxicity in rodents. DDT and mirex are cited as examples of carcinogenic compounds which can be replaced by other insecticides or dispensed with. The persistence of polychlorinated biphenyls, the rapid *in vivo* degradation of Captan, and the extreme toxicity of some of the dioxins are characteristics which demand extreme fastidiousness in use and analysis.

72-1356. Slama, K. (Dept. of Insect Physiology, Entomological Inst. of the Czechoslovak Academy of Sciences, Prague, Czechoslovakia). **Insect juvenile hormone analogues.** *Annu. Rev. Biochem. 40: 1079-1102; 1971.* (172 references)

Research on insect juvenile hormone analogs (JHA) has become increasingly intense in recent years with the discovery that they can be used as specific insect control means. In 1956, the first extracts with juvenile hormone activity were isolated from abdomens of adult male cecropia moths, and subsequently identified as a sesquiterpenic alcohol, farnesol, and its aldehyde, farnesal. Since that time, many other classes of chemical compounds with juvenile hormone activity have been discovered: these include acyclic terpenes, acyclic terpenoids with heteroatoms in the chain, acyclic sesquiterpenoid homologs (cecropia hormone type), alicyclic sesquiterpenes (juvabione type), aromatic terpenoid ethers, thioethers, and amines; peptidic JHA; and other nonterpenic JHA such as dodecanol ethers and sesamex. The influence of structural parameters on juvenile hormone activity of various JHA types depends on the insect species employed for testing. Utilization of JHA for insect control will depend on reliable knowledge of their physiological and biochemical effects, and consideration of application method and timing. Before attempting to use JHA as insect control agents, additional studies are needed on their effects on other arthropod and non-arthropod life forms.

72-1357. Lloyd-Jones, C. P.; Seba, D. P.; Prospero, J. M. (Dept. of Agriculture and Horticulture, U. of Bristol, England; Rosenstiel School of Marine and Atmospheric Science, Miami, FL 33141). **Pesticides in the lower atmosphere of the northern equatorial Atlantic Ocean. Discussions; authors' reply.** *Atmos. Environ. 6(4): 283-284; 1972.* (8 references)

In a Letter-to-the-Editor, Lloyd-Jones questions the meaningfulness of an experimental method which attempts to assess environmental contamination with DDT by determining only the fraction of total atmospheric DDT which is adsorbed on particulate matter. Studies by other authors have shown that the particulate fraction comprises only a minor portion of total atmospheric DDT, the exact ratio depending on geographic location and related factors (e.g., particulate-matter content of the air). Seba and Prospero, the authors of the report in question (see Abstract No. 72-0478), reply that they are aware of the shortcomings of their methodology, which is restricted due to a lack of manpower and equipment. However, they hoped that their findings would serve the dual purpose of offering at least a lower limiting value for atmospheric contamination by DDT at Barbados, and of detecting any changes in pesticide concentration which occur over time.

72-1358. Anonymous. **Pesticide economics moving in new directions.** *Chem. Eng. News 50(17): 20-21; 1972.*

Changes in pesticide development, production, and use were predicted during a symposium on economics of

pesticides at the American Chemical Society national meeting in Boston. Representatives from Dow and Union Carbide emphasized the tremendous cost in time and money involved in marketing a pesticide, presently, and it was generally felt that companies could no longer afford to research anything but the most promising projects. While the pesticide field is becoming less attractive, farmers are moving toward combined use of pesticides and other controls. Resistant plants and new culture methods are being developed. The most important factor in this shift of emphasis is the insects' development of resistance to chemicals.

72-1359. Anonymous. **Environmental protection in Sweden.** *Indian East. Eng. 113(2): 639-643; 1971.*

Due to the low population density in Sweden, environmental pollution problems are not as acute as in other countries. However, increasing migration to the cities and air- and water-borne drift of pollutants (generated in other countries) have created concern about the environment. Sweden passed a law of environmental protection in 1969, requiring anyone involved in activities endangering the environment to contact the National Board of Environmental Protection. The Board would then set the conditions under which such activity could be continued. Specific legislation governing pesticide use was also promulgated; for example, the use of alkylmercury as a seed dressing was banned in 1965, and all seed disinfection made subject to inspection. The use of DDT was banned in 1970, though it was noted that no specific harmful effects on human health had been recorded. This prohibition was based on conditions specific to Sweden where there is low insect infestation and slow chemical degradation due to the cold climate. Other features characterizing the Swedish efforts are the establishment of channels of communication between government and industry, and a broad public information program.

72-1360. McAleese, D. M. (Agricultural Chemistry Dept., University College, Dublin, Ireland). **Environmental pollution and health: fertilizers and pesticides.** *J. Ir. Med. Ass. 64(421): 521-524; 1971.*

The use of fertilizers and pesticides in Ireland is discussed. Fertilizers have not yet presented a serious pollution problem, although usage has increased from 5,000 tons in 1948 to 70,000 tons in 1970. If efforts are not made to reduce inefficient utilization of fertilizers, it is expected that excess nitrate in runoff might present the most serious hazard. Pesticides have been valuable, along with fertilizers, in increasing food production, though the problem of toxic residues in the environment still remains. While Irish foods analyzed for pesticide residues all contain organochlorines, most samples have very low levels of pesticides. Modern technology can reduce hazards by developing more specific chemicals, improved formulation and better methods of use; biological control and broad environmental agricultural education should also be developed.

72-1361. Taylor, D. A.; Amos, R. A.; Stevens, J. T.; Thomas, J. A. (West Virginia U. Medical Center, Morgantown, WV). **Pesticides and the environment.** *J. Sch. Health 42(2): 82-85; 1972.* (11 references)

Current knowledge of pesticides is based on nearly 30 years of increasingly extensive usage, beginning with employment of DDT to control typhus and malaria vectors during World War II. The first record of pesticide use was made at tht time of Marco Polo. Development has proceeded from heavy-metal preparations and botanicals used in the last century to commercial production of more than 700 pesticides. Research is now directed toward finding chemicals with highly specific effects, i.e., those destroying the target organism without harming man or his environment. The most commonly used pesticide classes are the organochlorines and organophosphates. The toxicity pattern of the organophosphates, the more toxic group, has been extensively investigated; it consists primarily of cholinesterase inhibition and thus acetylcholine accumulation. Increasing consciousness of environmental damage has provided impetus in searching for alternative control methods. These methods include plant breeding for pest resistance, insect attractants and trapping, insect population control by sterilization, and hormonal control of insect life cycles. The chemical companies are taking the lead in the search for insect pathogens and hormones.

72-1362. Center for Disease Control (Public Health Service, Health Serv. Mental Health Admin., U.S. Dept. of HEW, Savannah, GA 31402). **Public Health Pesticides.** *Pest Contr. 40(4): 35-65; 1972.* (7 references)

The annual report by the Center for Disease Control (CDC) provides current information on the use of pesticides in controlling organisms which are of public health significance. The information contained in the report is primarily furnished by the CDC, and also by other public health-related agencies of Federal, State, and Local governments. The U.S. Public Health Service (PHS) believes that the use of DDT in malaria-eradication programs in countries other than the U.S. is crucial to man's well-being, while only certain emergency conditions require its use within the U.S. Any well planned pest-control program must include both chemical means and nonchemical measures (sanitation, elimination of breeding sites), and be based on a sound knowledge of the pest involved. The development of pesticide resistance by various insect and rodent species has been reported; however, an apparent slight drop in susceptibility to a chemical should be substantiated by field efficacy observations before an alternate procedure is selected. Pesticide hazards can be minimized by following reasonable precautions. The pesticides and methods available for controlling mosquitoes, flies, fleas,

ticks, chiggers, lice, cockroaches, venomous arthropods, and rodents, as well as the regulations governing their use are discussed.

72-1363. Markkula, M. (Agricultural Research Centre, Dept. of Pest Investigation, Tikkurila, Finland). **Inspection procedure in Finland for pesticides and other agents affecting health.** *Pesticides 6(2): 22-26; 1972.*

In Finland the principal regulations controlling agents affecting human health are contained in the Food Act and the Pesticide Act of 1969, and the Foodstuff Act of 1941. The Pesticide Act deals mainly with efficacy testing of pesticides and monitoring of their use, production, storage and transportation; it also provides measures for the prevention of damage to human health or nature. The Poison Act is up-to-date, dealing with all substances which might harm human health or the environment, not restricting itself to the "classical poisons". The Foodstuffs legislation has little pesticidal relevance at present, as residue tolerances have not been established in most cases. However, an amendment to this act requires records to be kept of pesticidal applications, and that these be furnished to authorities upon request. The Plant Protection Institute is the major agency involved in registration, testing and granting of sales licenses for pesticide usage. The Institute submits test results and its recommendations about a pesticide to the Ministry of Agriculture and Forestry which then submits its findings to the Ministry of Social Affairs and Health. The legislation governing pesticide licensing in Finland is generally considered adequate; however, personnel shortages prevent it from being fully enforced.

72-1364. Knaus, J. P. (Krankenhaus Eichhof, 642 Lauterbach, Germany). **Das Spiel mit der Gesundheit. [Playing with health.]** *Prot. Vitae 1: 26-29; 1972.* (19 references) (German)

The dangers which pesticides hold for man are discussed, using logical arguments based on the principle of similitude. It is known that plants, microorganisms and higher animals have similar responses to many substances (such as vitamins). A corresponding parallelism could be expected to exist with regard to the noxious effects synthetic chemicals have in plants and insects, and in man. It is argued that synthetic fertilizers and pesticides are not needed to meet the world's food needs. In fact, it is noted that systematic application of natural fertilization methods should reduce the demand for pesticides. This argument is based on findings suggesting naturally-fertilized plants, and animals fed with them, are more resistant to disease and pest infestations than those supplied with synthetic fertilizers. Another argument against widespread use of synthetic chemicals, including pesticides, involves their potential carcinogenicity. Carcinogenic and mutagenic substances have not been found to be produced by living organisms, while DDT has been reported by some investigators to promote cancer in rats. Further study of the carcinogenic properties of synthetic chemicals is needed.

72-1365. Marstrand, P. K. (U. of Sussex, Science Policy Research Unit, Falmer, Brighton, Sussex BNI 9RF, England). **Report on a survey of pollution by oil and pesticides.** *Report of the U. of Sussex Sci. Policy Res. Unit. 1971. 12 p.* (11 references)

In order to determine the economic and public-health significance of water pollution by oil and pesticides in the United Kingdom, questionnaires were sent to the twenty-nine river authorities and two conservancies of England and Wales and four of the six river purification boards of Scotland; all but one replied. A second series of questionnaires was answered by 120 of the 158 water supply agencies contacted. Twenty-three river authorities reported at least occasional incidents of pesticide pollution, generally described as the result of accident. Since only eight of the river authorities queried had direct access to a gas-liquid chromatograph, pesticide pollution may well have gone undetected unless severe enough to cause fish kills or undergo organoleptic detection. Of the water-supply agencies, nine reported experiencing pesticide pollution problems at some time, with varying amounts of financial loss and inconvenience caused by enforced shutdowns, cleanup efforts and discarded water.

72-1366. Robinson, D. W. (The Agricultural Inst., Kinsealy Research Centre, Dublin, Ireland). **Herbicides, amenity and the environment.** *Sci. Hort. 23: 132-138; 1971.* (8 references)

The safety of herbicides in crop production has been demonstrated by practical applications over the past decade, as well as by scientific investigations. When used properly, herbicides do not injure desirable plants, soil microorganisms, soil fauna, wildlife or human life. All of the herbicides currently utilized break down rather rapidly under natural conditions, making chronic effects an unlikely occurrence. Horticulture as a science has become more important to human well-being as recreation and leisure-time activities have increased. Techniques for safe weed control and soil management established in the soft fruit industry are applicable to shrub horticulture.

72-1367. Fletcher, W. W. (U. of Strathclyde, Glasgow, Scotland). **Pests, pesticides and the environment.** *Sci. Hort. 23: 139-142; 1971.*

Ravages caused by insect, fungus, weed and rodent pests strongly document the need for pesticides. Plague, dysentery, typhus and malaria are examples of insect-borne diseases responsible for much human suffering and death. Great strides in controlling these diseases and reducing famine have been made with the introduction of pesticides. Pesticide use began in the mid-nineteenth

century and culminated in the mid-twentienth with the introduction of a wide variety of compounds. Pesticide science is now entering a phase where disease-prevention benefits are being evaluated in terms of damage to the environment. It is obvious that all of man's activities alter the environment to some extent. Damage to wildlife by pesticides has been indicated in some studies. However, these studies must be carefully evaluated. For example, the use of aldrin and dieldrin as spring seed dressings resulted in the death of some wild birds which ate the seeds, but when these insecticides were used in the fall instead, bird losses were minimized.

72-1368. Ennis, Jr., W. B. (Crops Protection Research Branch, Plant Sciences Research Division, ARS, U. S. Dept. of Agriculture, Beltsville, MD 20705). **Benefits of agricultural chemicals.** *Weed Sci. 19(6): 631-635; 1971.* (8 references)

In assessing the pros and cons of agrochemical usage, a dollar value can be estimated for certain factors, while for many others an objective economic evaluation is not feasible. To counterbalance the unfavorable publicity given to many pesticides today, it is necessary to consider their beneficial effects. Thus, they make available ample supplies of wholesome foods by increasing crop yields and reducing agricultural labor requirements. Agricultural chemicals, especially herbicides, have also faciliated mechanization of agricultural production. This has freed agricultural laborers for employment in other, possibly less strenuous or more rewarding fields. In reducing the acreage required for food production, agricultural chemicals have promoted improvements in management and utilization of land. Agricultural technology has also permitted better utilization of goods already produced, via preservation. The increased availability of land offers recreational and health benefits. Finally, pesticides provide aesthetic benefits which are of humanistic value though of secondary economic importance.

72-1369. Simmonds, F. J. (Commonwealth Inst. of Bio logical Control, Trinidad, W.I.). **Better buy biocontrol.** *Your Environ. 2(3): 104-108; 1971.* (3 references)

A review is presented of some of the successful efforts to control pests by the use of natural enemies, beginning with the use of ants on citrus trees in China around the year 1200 A. D. "Success" ranges from complete control of a pest to partial control, where pest damage and crop loss are reduced, but other control measures are necessary. Complete control was achieved in the cases of the coconut scale *Asphidiotus destructor*, the sugarcane borer *Diatraea saccharalis*, and the sugarcane leaf-hopper *Perkinsiella saccharicada*. Although interest in biological control waned with the advent of DDT and other chemicals, research continued in areas in which the cost of pesticides was high relative to the crop value. As awareness of the hazards of chemical pest control grew, more emphasis, but not nearly enough, was placed on biological control. Analysis of the economy of some recent successes indicates that the cash benefits obtained are many times the initial expenditure. The Institute of Biological Control, Trinidad, is presently working on control of some of the world's most costly water-weeds, a number of insect pests and several forest pests.

72-1370. Sram, R. J. (Ustav Hygieny Obecne a Komunalni, Institut Hygieny a Epidemiologie, Prague, Czechoslovakia). **Vliv chemickych latek na genetickou zatez populace. [The influence of chemical substances on the genetic load of man.]** *Cesk. Hyg. 6(7/8): 262-268; 1971.* (87 references) (Czech)

The mutagenic effects of various chemicals, including pesticides, on humans and lower organisms are reviewed. The mutations are the result of intragenetic changes and chromosomal aberrations. In laboratory studies, organochlorine insecticides have caused these changes in bone marrow of mice. Several organochlorines and organophosphates have induced mutations in plants and bacteria. Dithiocarbamate fungicides were found to increase the incidence of chromosomal aberrations in humans handling them. Other fungicides have caused mutations in yeast, bacteria, and tissue culture. Herbicides have produced similar changes in plants, tissue culture, and *Drosophila*. Chemosterilants (aziridine derivatives and their non-alkylated homologs) have induced mutations in both mice and *Drosophila*. The steadily growing genetic load on the population may increase the incidence of diseases of a genetic etiology, cause premature aging, and increase the susceptibility to other diseases, such as cancer. It is therefore imperative that the mutagenic effect of any new pesticide be assessed before it is certified for use.

72-1371. Erdos, G.; Desi, I.; Major, M.; Sztankayne Gulyas, M. (Orszagos Kozegeszsegugyi Intezet, Budapest, Hungary). **Novenyvedoszerek, rovar- es ragcsaloirtoszerek engedelyezesenek kornyezethigienes vonatkozasai. [Licensing of herbicides, insecticides, and rodenticides in relation to environmental hygiene.]** *Nepegeszsegugy 53(2): 119-121; 1972.* (10 references) (Hungarian)

Conventional toxicology tests are not suitable for use in pesticide licensing procedures, since they are unable to simulate within a reasonable time the processes which may occur over several years of field application. Therefore, a new testing method, requiring several weeks or months, has been developed. For pesticides of unknown toxicity, the acute oral and percutaneous toxicity is first determined in white rats. Then, guinea pigs and rabbits are used for skin and eye sensitivity studies. Neurotoxicity tests, especially electroencephalography, have been the most useful in determining the effects of very small doses. In such tests, the responses of treated animals to sound, light and other effects are evaluated visually or by computer. Pesticide

residue levels which can be anticipated in soil and water are determined by gas chromatography in model experiments.

72-1372. Okun'kov, P. S.; Poloz, D. D.; Talanov, G. A. (Administration of Veterinary Medicine, USSR Ministry of Agriculture, Moscow, USSR). **Usilit' kontrol' za soderzhaniyem pestitsidoy v kormakh. [The need for better pesticide content control in feeds.]** *Veterinariya 47(7): 16-20; 1971.* (6 references) (Russian)

Chemical composition, climatic conditions, soil type and amount of chemical applied are the main factors governing the occurrence of pesticide residues in the environment. Organochlorines such as DDT or BHC may persist in certain high-loam soils for 13 to 15 years. In the Soviet Union, the utilization of DDT on livestock farms was prohibited in 1965, and since 1970, it has only been used under strict limitations with a few crops. Mercurial fungicides such as granosan, agronal (phenylmercury bromide) and phenylmercury acetate (PMA) often occur as feed contaminants because of failure to observe elementary safety precautions. Organophosphate insecticides, acaricides and defoliants are usually degraded within 20-45 days after application. Decomposition of carbamates such as carbaryl, zineb or ziram on plant surfaces occurs within 15 days, but residues may be found in the soil 30 days after application. Herbicides such as 2,4-D and 2,4,5-T are rapidly hydrolyzed into harmless compounds, but systematic monitoring of 2,4-D used as an arboricide on pastures is advisable. Pesticide monitoring programs should aim at the prevention of untoward incidents.

72-1373. Tibaldi, E. (Author address not given). **Divagazioni in tema di ecologia. [Thoughts on ecology.]** *Inquinamento 14(1): 33-35; 1972.* (8 references) (Italian)

As a result of modern technology a vast number of pollutants have been generated, greatly affecting the nature of the ecology. While some pollutants have been diluted in air or water, others have undergone concentration or accumulation in various organisms. The food chain is one of the main vehicles for such processes. The continuity of the circle described by certain biospheric agents is exemplified by the fate of DDT. The insecticide was spread by the WHO in Borneo during a malaria prevention campaign for the extermination of mosquitoes. While the majority of mosquitoes was exterminated, some became resistant and accumulated large amounts of DDT. Lizards eating these mosquitoes were then killed, and this led to the extermination of cats feeding on the DDT-contaminated lizards. Finally, bubonic plague was triggered by mice accumulating large amounts of the pesticide.

72-1374. Haile, D. G. (Texas A & M U., College Station, TX). **Wind tunnel analysis of spray drift of slow-evaporating herbicide carriers.** *Diss. Abstr. Int. 32(10): 5755B-5756B; 1972.*

Atomization and drift characteristics of several herbicide carriers were compared in a horizontal wind tunnel. The center air velocity of 150 fpm was produced at a low turbulence level. The air conditions used, 90°F-20% relative humidity and 70°F-90% relative humidity, were selected to give high and low evaporative potentials, respectively. In the first series of experiments, sprays from flat fan nozzles were introduced into the wind tunnel, and the amounts of spray material drifting downward from the nozzle measured. The magnitude of drift was found to primarily reflect differences in the degree of atomization, which increased in the following order: paraffin oil, glycerol-water, mineral oil, water, cetyl alcohol-water, and diesel oil. The second experimental series entailed injection of discrete sizes of droplets (100 to 500 μ) into the wind tunnel and measurement of the horizontal distance traversed by the droplets before being deposited on the tunnel floor. In this series, effects of density and evaporation rate showed opposing tendencies. Due to the effect of density in the data range, water had shorter drift distances than the lighter density oils, even with the effect of evaporation at 90°F. Upon extrapolation to droplet sizes below 100 μ the situation would reverse itself. The glycerol-water mixture having the highest density used gave the lowest drift. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-13,224.)

72-1375. Ritter, W. F. (Iowa State U., Ames, IA). **Environmental factors affecting the movement of atrazine, propachlor, and diazinon in Ida silt loam.** *Diss. Abstr. Int. 32(10): 5757B; 1972.*

Atrazine, propachlor and diazinon losses in sediment and surface runoff were measured in four watersheds, two in ridged planted corn and two in surface contoured planted corn. A storm occurring 7 days after pesticide application removed 16% of the atrazine in the original chemical form applied to the surface contoured watershed. Propachlor losses in a storm occurring 8 days after pesticide application amounted to 2.6%. No appreciable diazinon was lost in surface runoff and sediment from a storm occurring 4 days after application. Pesticide losses from ridged watersheds were lower than the preceding values found for contoured watersheds. Pesticide concentrations in the sediment were generally higher than in the water, but total losses via water were higher due to its greater volume. Atrazine and propachlor moved slowly in the soil profile, less than 50% of the quantity applied remaining in the 0- to 6-inch layer at 30 to 40 days after application. In laboratory tests of the movement of atrazine, propachlor and diazinon by diffusion in Ida silt loam soil, an increase in temperature or in soil moisture content increased pesticide diffusion. Average diffusion coefficients for propachlor, atrazine, and diazinon at 80°F were 1.90, 1.36 and 0.63 mm^2/day, respectively. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-12,588.)

72-1376. Tanabe, H. (National Inst. of Health, Tokyo, Japan). **[Pesticide residues in foods.]** *Gekkan Yakuji (Pharm. Mon.) 14(4): 657-661; 1972.* (Japanese)

The problem of agricultural chemical residues in foods is undergoing continued study in Japan. At present, maximum permissible residue levels have been established for 204 agricultural chemicals and their degradation products in commodities such as cucumbers, tomatoes, grapes, apples, cabbage, strawberries, tea, summer oranges (skin and fruit), pears, potatoes, peaches, rice, turnips (root and leaf), persimmons, radishes (root and leaf), pumpkins, various beans, eggplant, Chinese cabbage, pimientos, oranges, and lettuce. Upon completion of the required studies maximum residues will be established in sweet potatoes, wheat, corn, watermelons, various other melons, cauliflower, parsley, asparagus, celery, broad bean and other commodities. According to animal experiments performed at the laboratories of the Japanese National Institutes of Health, the permissible daily intake of β-BHC is 0.5 mg/kg; thus a daily intake of up to 2.5 mg of β-BHC by the average Japanese adult is permissible. According to a study made in 1970, the β-BHC content of cow's milk is less than 0.1 ppm in most areas of Japan, and a daily diet containing one liter of milk will still provide far less than the maximum intake allowable for both adults and babies. Agrochemical residues in human milk, beef, and marine products are also reviewed.

72-1377. Chopra, S. L.; Khullar, F. C. (Dept. of Chemistry and Biochemistry, Punjab Agricultural U., Ludhiana, Punjab, India). **Degradation of parathion in soils.** *J. Indian Soc. Soil Sci. 19(1): 79-85; 1971.* (10 references)

Parathion degraded more rapidly under experimental conditions with increases in concentration, temperature, time of exposure to uv light, relative humidity, and pH. Alkaline and acidic soil supported a faster rate of hydrolysis than neutral soil. Some of the loss occurring with increasing temperature might have been due to vaporization.

72-1378. Kroger, M. (107 Borland Lab., University Park, PA 16802). **Insecticide residues in human milk.** *J. Pediat. 80(3): 401-405; 1972.* (14 references)

In 53 human milk fat samples the average total DDT content was 2.40 ppm. The values for lindane and heptachlor epoxide were 0.08 and 0.16 ppm, respectively. The level of total DDT was higher in samples from mothers nursing for the first time, but no informa-

tion was available on the initial pesticide burden of the mothers. The relationship did not hold for lindane or heptachlor epoxide. Only eight of the samples analyzed had total DDT concentrations below the 1.25 ppm tolerance established in the U.S. Code of Federal Regulations for milk fat of dairy cattle. Heptachlor epoxide and lindane have zero tolerances in cow's milk. The possible health hazards of these levels cannot be predicted at this time.

72-1379. Matthey, E. (Eidgenoessische Gesundheitsamt, Unterabteilung Lebenstmittelkontrolle, Bern, Switzerland). **Die Durchfuehrung der Lebensmittelkontrolle in der Schweiz im Jahre 1970. [Food inspection in Switzerland, 1970.]** *Mitt. Geb. Lebensmittelunters. Hyg. 62(3): 197-278; 1971.* (German, French, Italian)

Activities of the Swiss Federal Public Health Service, Food Inspection Section, include preparation of legislative publications, scientific research, testing of applicants in food chemistry and food inspection, and monitoring of food supplies (including import inspection). Excerpts from the reports of the cantonal inspection offices, official laboratories and food inspectorates are presented for various food categories. Excessive pesticide contents in milk and dairy products were reported from 7 cantons. This was due largely to high levels (> 5ppb) of dieldrin in milk specimens, generally stemming from contaminated hay. Dieldrin residues above the tolerance value were also found in cheese samples from two cantons. Eight samples of edible oils from Geneva contained up to 325 ppb of BHC isomers, 36 ppb dieldrin and 48 ppb. Dieldrin content was analyzed in a bull, obtained from a farm having high dieldrin residues in its milk; residues were 1275 ppb in the lipids of the meat and 2475 ppb in the fatty tissue lipids. Organochlorine insecticide contamination ranging from minimal to excessive was also found in some cereals, eggs, vegetables, and lipstick. Pesticide poisoning was judged responsible for the deaths of one cow, numerous wild birds, and several fish. In general, pesticide residues in Swiss products were lower than in 1969.

72-1380. Akasu, F. (Kanazawa U. Sch. of Medicine, Dept. Obstet. Gynecol., Kanazawa, Japan). **[Maternity and pollution.]** *Nippon Sanka Fujinka Gakkai Zasshi (J. Jap. Obstet. Gynecol.) 23: 759-764; 1971.* (Japanese)

Effects of various public nuisances (pollution) on mothers and their neonates are discussed. Organochlorine pesticides were not reported as causing delivery difficulties, deformities, or signs of carcinogenesis in mother or baby. However, residues were found in neonates with levels of BHC, DDT and dieldrin in twelve cases averaging to 0.001 ppm α-BHC, 0.001 ppm γ-BHC, 0.014 ppm β-BHC (a total of 0.016 ppm BHC), 0.002 ppm DDE, 0.006 DDT, and 0.008 ppm dieldrin. In the fat of a stillborn baby the following residues were found: 0.12 ppm β-BHC, 0.13 ppm total BHC, 0.96 ppm total DDT, and 0.09 ppm dieldrin. According to recent data from Kochi prefecture, organochlorine content in milk was at a level less than that of the Practical Residue Limit (PRL), established by the World Health Organization.

72-1381. Kawada, S.; Okuda, I.; Yoshinaga, E.; Kado, M. (Kumiai Chemical Engineering Co., Ltd, Japan). **[IBP (Kitazin P).]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 22: 70-84; 1970.* (34 references) (Japanese)

Residues of IBP (Kitazin P) in rice were analyzed. In areas where IBP was administered most frequently, rice usually contained residues at levels less than 0.02 ppm, though some reached 0.05 ppm; however, residues were generally not at dangerous levels. No correlation was found between amount of residue and frequency of spray, spray season, or form of IBP (powder, emulsion, or granular). In granular form, IBP is sprayed over the water of rice paddies, and approximately ten times more is required than in the other forms. IBP's effect is similar to that of other mercury and nonmercury pesticides used against rice blight. Various tests showed that IBP is especially effective against blight of grain ears.

72-1382. Beitz, H.; Seefeld, F.; Pank, F. (Institut fuer Pflanzenschutzforschung der Deutschen Akademie der Landwirtswissenschaften zu Berlin, Berlin, DDR). **Pflanzenschutzmittel-Rueckstaende an Arznei- und Gewuerzpflanzen: Lindan-Rueckstaende an Fenchel und Pfefferminze. [Residues of plant protection agents on medicinal and flavoring plants: Lindane residues on fennel and peppermint.]** *Pharmazie 26(10): 644-645; 1971.* (4 references) (German)

In 1961, East Germany prohibited the use of DDT on plants intended for medicinal or flavoring purposes, and lindane was suggested as a possible replacement. To study lindane residue dynamics, fennel plants were sprayed with a 0.05% lindane solution. Samples taken after one wk contained 0.59 ppm lindane; after two wk, 0.37 ppm; and after twelve wk, 0.90 ppm. The essential oils in fennel are presumed to protect lindane from degradation. Peppermint was sprayed with a 0.05% lindane formulation in May, and samples taken two mo later were found to contain 0.4 ppm lindane; four mo later, the lindane residues were below 0.1 ppm, similar to those in the untreated controls. The lower residues in peppermint, compared to fennel can be partly attributed to peppermint's more rapid growth rate.

72-1383. Stickley, B. D. A.; Hitchcock, B. E. (Bureau of Sugar Experiment Stations, Brisbane and Mackay, Queensland, Australia). **Dieldrin residues in the soil at harvest of second and third ratoon crops.** *Proc. Queensl. Soc. Sugar Cane Technol. 39: 257-259; 1972.*

Dieldrin residue determinations were carried out in the Mackay area to ascertain whether various soil types

had to be tested before each reapplication of pesticide. Results in various soils, based on an average soil density, did not vary significantly. Following one application the mean residue levels of dieldrin in lbs/acre after the second and third ratoon crops were 2.5 and 2.2, respectively. Recommendations for reapplication could be made on the basis of these tests. Since all fields retained at least 1 lb/acre after 3 ratoon crops, 5 lbs/acre would be the maximum necessary. Four lbs of dieldrin/acre would be recommended for the Mackay area if application was not more than 4 yrs previous.

72-1384. Yagi, T.; Takahashi, S.; and Murata, T. (Application Lab., Shimadzu Seisakusho Ltd., Kyoto, Japan). **[Gas chromatography-mass spectrometric identification of parathion residues in green tea.]** *Shimadzu Hyoron (Shimadzu Rev.) 28(2): 89-92; 1971.* (10 references) (Japanese)

A gas chromatographic analysis of green tea revealed 4 ppm of what appeared to be (ethyl) parathion. Because of this unusually high residue level, further tests were performed using selective detectors such as electron-capture (ECD), flame thermal (FTD), and flame photometric (FPD). The responses of ECD, FTD, which is selective for organophosphates, and FPD, which is sensitive to both phosphorus and sulfur, confirmed these results. A ten-fold concentration of green tea extract was then chromatographed with a flame-ionization detector (FID). This extract contained unknown phosphate and chlorine components, which may be either residues of other pesticides or natural components of the tea. The identity of the peak believed to be parathion was confirmed, however, by gas chromatography-mass spectrometry.

72-1385. Bevenue, A.; Hylin, J. W.; Kelley, T. W. (Hawaii Agricultural Experiment Station, College of Tropical Agriculture, U. of Hawaii, Honolulu, HI). **Pesticide residues in our waters.** *Agr. Progr. Quart. 20(3): 1-3; 1971.* (5 references)

One-gallon random samples of drinking water, rainwater, and stream, lake, and coastal water, taken from convenient locations in Hawaii were found to contain only small amounts of chlordane, *p,p'*-DDT, *p,p'*-DDE, *p,p'*-DDD, dieldrin, and lindane, and no detectable amounts of other organochlorines. DDT was found at concentrations four times greater than that of other compounds. On the basis of national guidelines for maximum permissible levels, it was concluded that no problem existed, although analysis of slick and strata samples, seasonal samples, and samples from areas containing potentially high residues will be pursued.

72-1386. Chopra, N. M.; Sherman, L. R. (Dept. of Chemistry, North Carolina Agricultural and Technical State U., Greensboro, NC 27411). **Systematic studies on the breakdown of *p,p'*-DDT in tobacco smokes.** *Anal. Chem. 44(6): 1036-1038; 1972.* (12 references)

Various amounts of *p,p'*-DDT were added to pesticide-free tobacco samples. The samples were then studied for the production of methyl chloride, dichloromethane and chloroform, possible pyrolysis products of the trichloromethyl moiety. The value obtained (approximately 2000 μg methyl chloride/g of tobacco smoked) did not depend on the amount of DDT present and, because of the high chlorine requirement for such a value, was considered to come mainly from tobacco inorganic chlorine. Dichloromethane was not found in tobacco smoke, suggesting that dichlorocarbene, if formed, reacts with water and other constituents in preference to hydrogen. The amount of chloroform found was linearly related to the amount of *p,p'*-DDT present and none was present in DDT-free tobacco. The results indicate that about 4.6% of the trichloromethyl moiety of *p,p'*-DDT is converted into chloroform.

72-1387. Udeaan, A. S.; Bindra, O. S. (Punjab Agricultural U., Ludhiana, India). **Malathion residues in wheat grains in relation to dosages applied, storage period and receptacles used for storage.** *Bull. Grain Technol. 9(1): 13-19; 1971.* (15 references)

Results of an investigation of the treatment of wheat grains, var. Kalyansona, with emulsions of malathion indicate that if grain is to be stored for three months, 33 ppm is a safe dosage for grain protection in Punjab and the remaining areas of the wheat belt. Wheat treated in September contained residues from 1.48 to 2.22 ppm in the case of the 11 ppm dosage, from 3.58 to 6.32 ppm with the 22 ppm dosage, and from 8.21 to 9.37 ppm with the 33 ppm dosage. After six mo the average residue with the 33 ppm dosage was 4.42 ppm. Treatment over the summer months revealed a slightly lower residue with higher grain moisture content and a reduction in average residue for the 33 ppm dosage. Differences in residues in four types of receptacles appeared to be due to the difference in temperature, which was higher in mud bins in the winter and higher in metal bins in the summer. The 33 ppm level of safety was based on the above information and on the fact that the preparation of chapatis from the grains resulted in a reduction of the residue to 1/4 the level in grains.

72-1388. Awasthi, M. D.; Misra, S. S.; Verma, S.; Handa, S. K.; Dewan, R. S. (Div. of Agricultural Chemicals, Indian Agricultural Research Inst., New Delhi-12, India). **Phosphine residues from "Celphos" fumigated wheat grains Var. Kalyan Sona.** *Bull. Grain Technol. 9(1): 36-39; 1971.* (5 references)

Wheat grains, var. D Kalyan Sona, were essentially free of phosphine by the 5th day after warehouse exposure for 5 days to 6 g/ton of aluminum phosphide. Under laboratory conditions, residues were below the limit of detectability by the 4th day after degassing,

with up to 12 g/ton. By the 8th day no phosphine was detected, following a dose of 30 g/ton. Washing with water was effective in removing residues, possibly indicating that the product could be released immediately for consumption following washing. None of the doses investigated impaired viability of the grain.

72-1389. Horvath, A.; Deak, Z.; Schiefner, K. (Orszagos Kozegeszsegugyi Intezet, Budapest, Hungary). **Higanytartalmu csavazoszerek kimutatasa talajban es talajvizben. [Detection of mercurial seed dressings in soils and groundwater.]** *Egeszsegtudomany 16(1): 53-62; 1972.* (39 references) (Hungarian)

The movement of an organic mercury seed dressing, Agallol (methoxyethylmercury chloride), in soil was studied in model experiments and field tests. The model studies, carried out on 100-cm sand layers with 1 mg and 10 mg of mercury, revealed that sandy soils were not suitable for application of such compounds due to the marked washout. Field tests on a soil composed of 130 cm humus followed by a clay layer revealed maximum concentrations at the depth of introduction (45 cm), with values rapidly decreasing further down. Field tests on a soil consisting of 30 cm humus followed by sand, with groundwater level at 100 cm and depth of introduction 45 cm, showed both appreciable concentrations at the 100-cm depth and groundwater mercury contents of 24.7 mg/l. Due to the high toxicity mercury has for numerous organisms, its use should be avoided where the possibility of groundwater contamination exists.

72-1390. Soos, K.; Cieleszky, V.; Tarjan, R. (Orszagos Elelmezes- es Taplalkozastudomanyi Intezet, Budapest, Hungary). **A klorozott szenhidrogenek szintjenek alakulasa a budapesti lakossag zsirszoeveteben 1970-ben. [The development of the level of chlorinated hydrocarbons in the adipose tissue of the population of Budapest in 1970.]** *Egeszsegtudomany 16(1): 70-76; 1972.* (25 references) (Hungarian)

In 1970 the DDT concentration in the adipose tissues of adults in Budapest averaged 5.4 ppm, and the total DDT (DDT + DDE) concentration was 18.9 ppm. The total BHC isomer concentration was 0.76 mg/kg, of which γ-BHC (lindane) accounted for 0.35 ppm. Chlorinated hydrocarbon levels in newborns in Budapest were lower: total BHC 0.66 ppm; total DDT 8.43 ppm. When these data were compared with those of previous years, the DDT level in the adipose tissue of the population of Budapest appeared to parallel the sales volume of DDT. Decreases in adipose-tissue DDT levels since 1967 are attributed to the beginning of DDT depletion resulting from the restriction of DDT use in Hungarian agriculture.

72-1391. Khan, S. U. (Research Station, Canada Dept. of Agriculture, Regina, Saskatchewan, Canada). **Adsorption of pesticide by humic substances. A review.** *Environ. Lett. 3(1): 1-12; 1972.* (24 references)

A literature review is presented concerning mechanisms of adsorption of pesticides by humic substances. Hydrogen bonding and ion exchange are the most prominent mechanisms, though physical adsorption, charge transfer, ligand exchange and chemisorption may also play a role. Humic substances seem to have a solubilizing effect on hydrophobic organic molecules. The effects of temperature on adsorption by humic substances and those of pH, which tend to be greatest at pH levels around the pK values, are cited as well as techniques for studying such effects.

72-1392. Youngs, W. D.; Gutenmann, W. H.; Lisk, D. J. (Dept. of Natural Resources, N.Y. State Coll. of Agriculture. Cornell U., Ithaca, NY 14850). **Residues of DDT in lake trout as a function of age.** *Environ. Sci. Technol. 6(5): 451-452; 1972.* (10 references)

In lake trout of accurately known age, residues of *p,p'*-DDE, *p,p'*-DDD (TDE), and *p,p'*-DDT increased progressively with age from about 1 ppm at one year to concentrations of about 14 ppm or higher at 12 years. The correlation between total residues (*p,p'*-DDE, *p,p'*-DDD, and *p,p'*-DDT) in fish and their age was highly significant. (Author abstract reprinted by permission of the American Chemical Society).

72-1393. Greve, P. A.; Wit, S. L. (Lab. of Toxicology, National Inst. of Public Health, Utrecht, The Netherlands). **Endosulfan in the Rhine River.** *J. Water Pollut. Contr. Fed. 43(12): 2338-2348; 1971.* (9 references)

River and drinking water were monitored for endosulfan in five regions of The Netherlands after a massive fish kill in the Rhine River in West Germany. Endosulfan was found at a maximum concentration of 0.70 ppb ($\alpha + \beta$) on the first day of the investigation. After one month the level was below the limit of the assay. Laboratory studies on the rate of hydrolysis indicated that under anaerobic conditions the half-life is about 5 wk at pH 7.0, and about 5 mo at pH 5.5. Oxidation rates did not vary with pH. The half-life was reduced to one wk at pH 7.0, under aerobic conditions in the presence of *Pseudomonas* (10^5/l.). Since 82 to 85% of the endosulfan was found to be removed by filtration or centrifugation and almost all could be removed by iron flocculation or treatment with activated carbon, it was decided that the water could be prepared for drinking. Endosulfan was found to be not only adsorbed but effectively degraded in the presence of ferric hydroxide.

72-1394. Foehrenbach, J. (New York State Dept. of Environmental Conservation, Ronkonkoma, NY). **Chlorinated pesticides in estuarine organisms.** *J. Water Pollut. Contr. Fed. 44(4): 619-624; 1972.* (17 references)

Ten stations in marine waters around Long Island, N. Y. were monitored for distribution and concentrations of chlorinated hydrocarbons. Of the nine compounds sought, only DDT, DDD (TDE), DDE and dieldrin were found. Few shellfish concentrations of DDT together with its metabolites were greater than 0.2 mg/kg. There was a correlation between land use in the watershed and concentration of DDT and its metabolites in shellfish. An estimate of the DDT level in the waters was several orders of magnitude lower than levels known to be toxic to several species of aquatic life. Dieldrin concentrations in shellfish, generally lower than DDT concentrations, were found to be highest in areas where the watershed contained large lawn areas of country clubs or estates rather than agricultural land. Concentrations of dieldrin and DDT-related compounds were higher in random samples of species higher in the food chain. Although quantities of the pesticide which would adversely affect the black skimmer and marsh hawk are not known, concentrations of total DDT were high enough to cause concern.

72-1395. Brady, M. N.; Siyali, D. S. (Div. of Analytical Lab., Lidcombe, New South Wales, Australia). **Hexachlorobenzene in human body fat.** *Med. J. Aust. 1(4): 158-160; 1972.* (12 references)

Chlorinated hydrocarbon pesticide residues in 75 samples of Australian perirenal fat were generally found to be about the same as those reported in surveys elsewhere. However, hexachlorobenzene (HCB), previously unreported, was found in all samples in a mean concentration of 1.25 ppm. The probable source of the fungicide was foodstuffs, primarily eggs from chickens which had been fed left-over HCB-treated seed wheat. Elimination of this poor agricultural practice could prevent the contamination observed in eggs.

72-1396. Gostick, K. G.; Heuser, S. G.; Goodship, G.; Powell, D. F. (Plant Pathology Lab., Harpenden, Herts, England). **Bromide residues in potatoes fumigated with methyl bromide.** *Potato Res. 14: 312-315; 1971.* (6 references)

Treatment of potatoes with methyl bromide was carried out to resolve the discrepancies in findings reported in previous studies. Potatoes were treated under conditions similar to normal import treatment and exposed to excess amounts of methyl bromide (180 or 200 mg × h/l.). Results indicated that no free methyl bromide remained after 24 hrs. In unfumigated potatoes the highest total bromide level was 4 ppm. Temperature did not seem to affect the level of bromide, and the average increase after fumigation was 17 ppm. Higher residues were found in immature potatoes grown at the laboratory and fumigated the day after lifting.

72-1397. Jagnow, G.; Haider, K. (Institut fuer Bodenbiologie and Institut fuer Biochemie des Bodens, Forschungsanstalt fuer Landwirtschaft, Bundasallee 50, 3301 Braunschweig, Germany). **Evolution of $^{14}CO_2$ from soil incubated with dieldrin-^{14}C and the action of soil bacteria on labelled dieldrin.** *Soil. Biol. Biochem. 4(1): 43-49; 1972.* (26 references)

An investigation was carried out to determine whether degradation of dieldrin-^{14}C, labelled uniformly in the chlorinated ring, to labelled carbon dioxide would occur in soils or microbial cultures. During a 7-wk period, sterile and nonsterile soil treated with 10 ppm dieldrin-^{14}C released 0.304% and 1.86% of the activity as labelled carbon dioxide, respectively. Percolated or aerated soil samples treated with 50 ppm dieldrin-^{14}C released about 0.3% of the activity as carbon dioxide whether or not glucose was added. About half of the microorganisms, whether isolated from talcum tablets with or without dieldrin buried in moist soil for eight weeks, produced water soluble metabolites from dieldrin-^{14}C. Coryneform bacteria and mycobacteria predominated in both isolates. Autoradiograms of extracted incubated soil samples indicated the presence of seven or more metabolites with a polarity greater than that of dieldrin. Chromatographic samples from benzene or chloroform extraction showed 1 to 6 metabolites.

72-1398. Smith, A. E. (Canada Dept. of Agriculture, Regina Research Station, Box 440, Regina, Saskatchewan, Canada). **Degradation of bromoxynil in Regina heavy clay.** *Weed Res. 11(4): 276-282; 1971.* (9 references)

A laboratory investigation of the persistence of bromoxynil (3,5-dibromo-4-hydroxybenzonitrile), as the free phenol, using a new spectrophotometric method of analysis, revealed a rather rapid breakdown, probably due to microbial action. The analytical method involved extraction of the sample in methanolic KOH, evaporation of the solvent, dissolution in aqueous KCl and spectrophotometric measurement over a range of 340 to 240 nm. Degradation products were removed from soil by acidification and extraction with ethyl acetate. Concentrated samples were chromatographed on paper and on thin layer silica gel. Less than two weeks were required for 50% degradation in Regina heavy clay except at the lowest temperature (18°C) and moisture level (20%). In sterile soil samples, more than 90% of the bromoxynil remained after 3 wk. It was concluded that the chemical is hydrolyzed by microorganisms to the amide, which is converted into the acid analog.

72-1399. McKone, C. E.; Hance, R. J.; Burchill, D. J. (ARC Weed Research Organization, Begbroke Hill, Yarnton, Oxford, England). **Herbicide residue determinations and taint tests on fruit from gooseberries treated with chlorthiamid and dichlobenil.** *Weed. Res. 11(4): 283-291; 1971.* (7 references)

Residues of total nitrile, 2,6-dichlorobenzamide and 2,6-dichlorobenzoic acid were determined in gooseberry crops which had been treated with up to 33.6 kg/ha of chlorthiamid or dichlobenil. Application in March produced lower nitrile levels than later application, but residues were all less than 0.05 ppm. Amide residues, which were found only in crops having high doses applied early, were considerably higher than nitrile residues but none were greater than 0.45 ppm. Acid residues, found in 4 of the 13 samples tested, did not exceed 0.2 ppm. Canned products from treated crops contained no taints, although some changes in flavor were detected.

72-1400. Watanabe, T.; Goto, S. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Absorption and translocation of arsenic and lead in soil by cucumber.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 10(5): 57-61; 1970.* (6 references) (Japanese)

Cucumber seedlings were grown in Wagner pots, on autoclaved soil to which definite quantities of lead arsenate or arsenious acid had been added. When the fruits matured, the plants were divided into portions of fruit, stems, leaves and roots, and analyzed for arsenic and lead by the Gutzeit method and alternating-current polarography, respectively. Arsenic and lead were scarcely detectable in fruit and stem (arsenic 0.1 and 0.2 ppm; lead 0.02 and 0.4 ppm respectively) and did not display a definite relationship to soil content. At the highest soil application level (125 mg arsenious acid as arsenic trioxide) arsenic contents were above 3.2 ppm in the leaf and above 32 ppm in the root. Lead was present at 1.50 ppm in the leaves of the plants grown in soil containing 375 mg of lead in the form of lead arsenate, and in the roots of the same plants at 53 ppm. The values at which appreciable accumulation of lead and arsenic occurred in the leaves of the cucumber plants were above those found reported in soils in most parts of the world. (From author abstract)

72-1401. Kawahara, T.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 5. Absorption of some chlorinated hydrocarbon insecticides from soil by eggplant.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 51-54; 1971.* (1 reference) (Japanese)

A mixture of chlorinated hydrocarbon insecticides was applied to soil and the following residues were found in the 0-20 cm layer 69 days after treatment: α-BHC 64 ppm; β-BHC 6 ppm; γ-BHC (lindane) 6 ppm; δ-BHC 3 ppm; aldrin 3 ppm; dieldrin 0.3 ppm; endrin 3 ppm; *p,p'*-DDE 0.2 ppm; *o,p'*-DDT 15 ppm; *p,p'*-DDT 40 ppm; heptachlor 3 ppm; heptachlor epoxide 2 ppm. The quantities found in the fruit of eggplant at this time did not amount to more than 0.01 ppm except for aldrin, dieldrin, and the DDT isomers. Pesticide levels found in fruit harvested at 55 days were higher than those at 69 days in the case of α-BHC, γ-BHC, endrin, heptachlor, and heptachlor epoxide, although the differences were small in some cases. The root generally had the highest pesticide content, followed by the leaf, the stalk and finally the fruit. Dieldrin was present in the root at 0.16 ppm (47% of the soil level), heptachlor at 0.35 ppm (10% of the soil level), γ-BHC, δ-BHC, aldrin, endrin and heptachlor epoxide at 2 to 3% of their respective levels in the soil; the remainder of the compounds were at less than 1% of their soil levels. Greater fractions of the DDT-derived compounds generally accumulated in the leaf; specifically, the *p,p'*-DDE content in the leaf amounted to 26% of the soil level compared to 0.5% for the root. (From author abstract)

72-1402. Kawahara, T.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 6. DDT and BHC residues in green tea.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 55-58; 1971.* (1 reference) (Japanese)

Total BHC (all 4 isomers) and total DDT residues were taken in soil from tea gardens in two Japanese prefectures. The residues ranged from 0.007 to 0.03 ppm for BHC and from 0.001 to 1.5 ppm for DDT. Residues in and on tea leaves ranged from 0.07 to 0.7 for total BHC and from 0.09 to 17 ppm for total DDT. Higher pesticide contents were found more often on old leaves than on new ones. The application and removal of cover straw on test plants had negligible effects on pesticide residues in the tea leaves. Extraction from green tea leaves to boiling water averaged 3% for *p,p'*-DDT, 4% for *p,p'*-DDE, and 5.6% for *o,p'*-DDT. Under the same circumstances, 3.8% of the α-BHC was extracted, 2.5% of β-BHC, 3.0% of γ-BHC (lindane) and no detectable δ-BHC (the δ-BHC content of the tea leaves was already close to the limit of detection). (From author abstract)

72-1403. Kawahara, T.; Moku, M.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 7. Chlorinated hydrocarbon pesticide residues in marketed cigarettes.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 59-60; 1971.* (2 references) (Japanese)

Gas chromatographic analyses were made of tobacco extracts from Japanese, German, and American brand cigarettes. The average pesticide contents for the three Japanese brands were as follows: α-BHC 0.1 ppm; β-BHC 0.2 ppm; γ-BHC (lindane) 0.1 ppm; δ-BHC 0.1 ppm; *p,p'*-DDT 0.4 ppm; aldrin 0.1 ppm; dieldrin 0.2 ppm; endrin 0.5 ppm. The West German and American cigarettes, similar in pesticide content, showed no detectable contamination with β-BHC, δ-BHC or aldrin. They contained average quantities of 0.02 ppm α-BHC, 0.1 ppm

γ-BHC, 5 ppm *p,p'*-DDT, 0.2 ppm dieldrin and 1.5 ppm endrin. (From author abstract)

72-1404. Kawahara, T.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 8. Absorption and translocation of chlorinated hydrocarbons in tobacco.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 61-66; 1971.* (3 references) (Japanese)

Treatment of tobacco acreage with chlorinated hydrocarbon pesticides gave the following soil levels: total BHC 0.02 ppm; aldrin 0.02 ppm; dieldrin, 0.08 ppm; and *p,p'*-DDT, 0.25 ppm. Forty days after treatment, tobacco grown in this soil contained about 1 ppm each of α-BHC, β-BHC, γ-BHC (lindane) and δ-BHC (control value subtracted and averaged over various plant parts in each case). Aldrin residues in tobacco grown on aldrin-treated soil after 40 days averaged 0.05 ppm, and dieldrin residues in the same tobacco were also 0.5 ppm. DDT residues after 40 days in tobacco grown on *p,p'*-DDT-treated soil averaged about 0.5 ppm as well, although there were considerable fluctuations in each case. Roots and leaves often displayed higher insecticide contents than stalks. (From author abstract)

72-1405. Kawahara, T.; Konuma, S.; Wada, T.; Kureha, Y.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 9. Absorption and translocation of chlorinated hydrocarbons into crops in a cold, mountainous region.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 67-72; 1971.* (Japanese)

When Chinese cabbage and burdock were grown on soil plots treated with a mixture of organochlorine insecticides, Chinese cabbage failed to take up appreciable quantities of the pesticide residues, while burdock displayed a tendency to concentrate them. For example, when total BHC was present in the soil at 3.3 ppm, burdock contained residues of the same magnitude, whereas residues in Chinese cabbage amounted to only 1% of the soil residue level. For other vegetables tested (radish, turnip, and spinach), as well as for a second test series of Chinese cabbage residue levels did not vary appreciably with the plant part though they changed with plant species and specific pesticide. In general, the order of absorption was heptachlor > endrin > aldrin > BHC > DDT, with Chinese cabbage absorbing the smallest residue quantities. (From author abstract)

72-1406. Kawahara, T.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 10. BHC residues on and in rice straw.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 73-75; 1971.* (Japanese)

Rice-paddy soil was treated with various quantities of BHC in 1969 and 1970, and at harvest time (1970) BHC isomers were found in the rice straw. A definite relationship did not always exist between the date and amount of soil application (i.e., the soil residue) and the residues in the rice straw. In various areas and at various application dates and rates, the following residues were found in rice straw: α-BHC 0.082 to 4.3 ppm; β-BHC 0.036 to 7.4 ppm; γ-BHC (lindane) 0.036 to 1.4 ppm; δ-BHC 0.01 to 3.2 ppm. There was a slight tendency for higher BHC levels to be present in the upper section of the rice straw. (From author abstract)

72-1407. Kawahara, T.; Matsu-ura, K.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 11. BHC in soil and river water in a forest.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 76-80; 1971.* (3 references) (Japanese)

Prior to spraying with a mixture of BHC isomers for forest pest control, soil levels of BHC residues in forested Japanese prefectures ranged from 2 to 22 ppb. After spraying by helicopter or ground duster, BHC soil residues of 2 to 2,000 ppb were found. Insecticide contents were generally higher in swamps than on hilltops. BHC residue levels increased with increasing organic content of soil, but did not seem to vary with moisture level. BHC residue contents in river water for treated and control areas remained relatively constant at 0.01 and 0.3 ppb. BHC levels in downstream river areas tended to be higher than those near the source. (From author abstract)

72-1408. Kawahara, T. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 12. Absorption and translocation in turnip of aldrin and dieldrin.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 81-86; 1971.* (2 references) (Japanese)

Aldrin was added to soil used for growing potted turnips at seven levels between 0.05 and 50.0 ppm. The dieldrin content of the soil increased only slightly with increasing aldrin added. While the percentage of dieldrin out of the total soil residue decreased almost continuously with increasing residue level, the percentage of dieldrin out of the total residue in turnip root and leaf passed through a maximum of almost 100% at 1 or 2 ppm of aldrin + dieldrin. The aldrin + dieldrin level in turnip root and leaf increased in a monotonic but not linear fashion with increasing initial aldrin soil concentration. Residues in the root were ten times greater than those in the leaf, and the percentage of dieldrin in the leaf was somewhat higher. The results indicated that the high ratio of dieldrin to aldrin in turnip is the consequence of both selective dieldrin absorption and aldrin epoxidation in the plant. (From author abstract)

72-1409. Kawahara, T. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Variation of MEP residue in and on cabbage.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 87-88; 1971.* (1 reference) (Japanese)

Residue levels found on cabbage leaves varied widely after being sprayed with MEP (fenitrothion). Five days after treatment, the average on the outer leaves was 0.0157 ppm with a standard deviation of 0.0138 ppm. On the inner leaves, the average was 0.6978 ppm, with a standard deviation of 0.5914 ppm. The residues dropped to one-third of the five-day level within ten days after spraying. Almost no fenitrothion was detectable on inner or outer leaves 20 days after treatment. In determining fenitrothion residues on cabbage leaves, it is necessary to select a sample large enough to insure that a representative value will be obtained after mixing. (From author abstract)

72-1410. Kawahara, T.; Maeda, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Residue analysis of Mesomil in crops.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 89-94; 1971.* (2 references) (Japanese)

Mesomil (methomyl) residues in crops were analyzed by gas chromatography with a flame photometric detector. This detector was considered superior to a microcoulometric or electron-capture detector. Residue quantities found in and on unpolished rice samples 60 to 83 days after the last field treatment were always below 0.001 ppm, although 65.9% of the Mesomil added to rice samples before analysis was recovered. In apples, where the recovery rate was 54.6%, residues ranged from 0.023 ppm in apples analyzed 45 days after the last treatment to 0.164 ppm in samples analyzed 30 days after the third treatment. In oranges, which gave 76.0% recovery, residues were below 0.001 ppm except for a value of 0.002 ppm in oranges analyzed 78 days after the last in a series of six treatments. Residues in and on green tea (recovery factor, 83.7%) were below 0.001 ppm in samples analyzed 21 and 27 days after treatment, and reached 0.4 ppm in tea specimens analyzed 7 days after treatment. Recovery from Chinese cabbage samples was good (92.4%); residue levels found ranged from 0.209 ppm at 14 days after treatment to 0.5 ppm 7 days after treatment. (From author abstract)

72-1411. Kawahara, T.; Ishii, Y.; Watanabe, T.; Fujimoto, Y.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Pesticide, fungicide and herbicide residues on and in food crops.** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 95-100; 1971.* (6 references) (Japanese)

Residues of five pesticides on different food crops at harvest were investigated, using the appropriate methodology in each case. Hydroxyisoxazole residues in unpolished rice did not exceed 0.05 ppm (the limit of detection) in samples taken between 151 and 169 days after one or two applications. Planavin (nitralin) residues were likewise below the limit of detection (0.06 ppm) in unpolished rice and sweet potatoes harvested between 101 and 159 days after treatment. The limit of detection (0.01 ppm) for Vanalate in strawberries and tomatoes was not exceeded in any sample taken between 55 and 90 days after treatment, nor was the limit of detection (0.02 ppm) for NH-6967 in unpolished rice at 109 and 119 days after treatment. Average Benomyl residues of 0.2 ppm were found in oranges at 31 to 104 days after treatment as well as in controls. In Japanese pears, residue levels of 0.2 ppm benomyl were found one month after treatment, and 0.1 ppm two months after treatment. Benomyl levels in control grapes were 0.09 ppm, and between 1 and 4 ppm in treated grapes one to three weeks after the last treatment in a series. Benomyl levels in unpolished rice control samples were 0.02 ppm, and reached 0.13 ppm 23 days after the last of six treatments. (From author abstract)

72-1412. Fujimoto, Y.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Arsenic residue in strawberry.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 106-107; 1971.* (1 reference) (Japanese)

Arsenic residues in strawberries sprayed with tri(dimethyldithiocarbamoyl) arsine (TTCA) were determined by the Gutzeit method. In all cases, the residues were below the tolerance established for arsenic in strawberries (1 ppm). Graphs of the decline in residue levels between application and harvest showed a smooth time course, and proportionality of residues to amounts applied was evident. After a single application of TTCA, 0.58 ppm of arsenic (as arsenic trioxide) were present in strawberries harvested 7 days later, 0.38 ppm at 14 days, and 0.29 ppm after 21 days. After five sprayings, 0.99 ppm arsenic were present at 7 days, 0.73 ppm at 14 days, and 0.61 ppm at 21 days. The regulations presently governing application of TTCA to strawberries (5 sprayings, 14-day waiting period before harvest) seem to insure that residues will be below the established tolerance level. (From author abstract)

72-1413. Bingham, S. W.; Shaver, R. (Dept. of Plant Pathology and Physiology, Virginia Polytechnic Inst. and State U., Blacksburg, VA 24061). **Uptake, translocation, and degradation of diphenamid in plants.** *Weed Sci. 19(6): 639-643; 1971.* (12 references)

The rate of uptake and translocation of *N,N*-dimethyl-2,2-diphenylacetamide (diphenamid-^{14}C) varied among different species. Apoplastic translocation of diphenamid occurred rapidly in tomato (*Lycopersicon esculentum* Mill.) seedlings, intermediate in bermudagrass (*Cynodon dactylon* L. '328') and slowly in winged euonymus [*Euonymus alatus* (Thunb.) Seib. 'compacta']. Diphenamid-^{14}C was dealkylated to give

N-methyl-2,2-diphenylacetamide (MDA) in both winged euonymus and tomato plants. After eight days, approximately 60% of the benzene-extractable labeled compounds from both plants was MDA and 39% was diphenamid. However, less of the radioactive material in winged euonymus was extracted. (Author abstract by permission)

72-1414. Hargrove, R. S.; Merkle, M. G. (Dept. of Soil and Crop Sci., Texas A&M U., College Station, TX 77843). **The loss of alachlor from soil.** *Weed Sci. 19(6): 652-654; 1971.* (17 references)

Gas chromatographic analysis of benzene extracts was used to study the effects of temperature and relative humidity on the degradation and volatilization of 2-chloro-2′,6′-diethyl-*N*-(methoxymethyl)acetanilide (alachlor) in the soil. The relative humidity of a closed system had little effect on alachlor retention in air dry Sawyer fine sandy loam at 22°C, but had a pronounced effect when soil temperature was 38°C or higher. At 0% relative humidity (38°C or 46°C) alachlor was degraded to 2-chloro-2′,6′-diethylacetanilide. Decomposition, which also occurred in 5 *N* aqueous HCl, was attributed to acidic soil water film surfaces. As relative humidity within the system increased, the rate of degradation decreased, apparently because condensation of water vapor increased the thickness of the soil water film and decreased the surface acidity. At 38°C, minimum loss was noted at 31% relative humidity, and at 46°C, minimum loss was found at 79% relative humidity. The increased loss of alachlor at relative humidities above these critical points was attributed to volatility and not to chemical degradation. (Author abstract by permission.)

72-1415. Bozarth, G. A.; Funderburk, Jr., H. H. (Dept. of Plant Pathology, U. of Missouri, Columbia, MO 65201). **Degradation of fluometuron in sandy loam soil.** *Weed Sci. 19(6): 691-695; 1971.* (7 references)

Degradation of 1,1-dimethyl-3-(*α,α,α*-trifluoro-*m*-tolyl) urea (fluometuron) in a sandy loam soil was investigated in time-course and $^{14}CO_2$ evolution studies. Degradation occurred only in nonautoclaved samples and was more rapid in glucose-amended soil, indicating that it is a function of microbial metabolism. Time-course studies showed that the pathway of degradation of fluometuron in soil is similar to that previously reported for other substituted ureas, involving a two-step demethylation, probably followed by hydrolysis of the urea linkage to form the aniline derivative. Further evidence for degradation was a small but significant recovery of $^{14}CO_2$ from soil treated with fluometuron labeled in the trifluoromethyl group. (Author abstract by permission.)

72-1416. Zitko, V. (Environment Canada, Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B., Canada). **Absence of chlorinated dibenzodioxins and dibenzofurans from aquatic animals.** *Bull. Environ. Contam. Toxicol. 7(2/3): 105-110; 1972.* (15 references)

A previously developed method for extraction of organochlorine compounds and separation of chlorinated dibenzodioxins and dibenzofurans was applied to muscle and liver of white shark, eggs of double-crested cormorants and herring gulls, and muscle of eel and pickerel as well as to commercial herring oil and groundfish-herring fishmeal from New Brunswick, Canada. The white shark liver contained 218 ppm of PCBs, cormorant eggs 45.6 ppm, gull eggs 7.45 ppm and herring oil 3.55 ppm; all other PCB residue contents were below 1 ppm. The shark liver also contained 335 ppm DDE, 43 ppm TDE, and 63 ppm DDT; cormorant eggs contained 32.1 ppm DDE, herring oil 2.27 ppm DDE and gull eggs 2.70 ppm DDE. The shark liver samples required repeated chromatography to prevent carryover of PCBs into the fractions being analyzed for dibenzodioxins and dibenzofurans. Limits of detection for chlorinated dibenzodioxins and dibenzofurans added to the above samples in recovery experiments were between 0.01 and 0.04 ppm; no inherent contamination by these compounds was detected in the samples tested.

72-1417. Routh, J. D. (Hopkins Marine Station, Stanford U., Palo Alto, CA). **DDT residues in Salinas River sediments.** *Bull. Environ. Contam. Toxicol. 7(2/3): 168-176; 1972.* (9 references)

To study pesticide residues in the Salinas River, which drains an intensively cultivated area, 100-g samples of the top three inches of bottom sediment were collected weekly from April 27 to May 17, 1971. Organochlorine residues were extracted with hexane, cleaned up, and analyzed by gas chromatography. At seven of the eight collection sites, levels of DDT and its derivatives were fairly constant and usually below 10 ppb. At the eighth, the total-DDT level was generally above 200 ppb, and individual *p,p′*-DDT, DDE, and TDE levels were sometimes above 100 ppb. The sediment at this point differed from that at the other sampling sites in that it contained a large amount of fine-particle, black, lightweight material, which was also found to have a very high total-DDT content. Thus it appears that the large amount of DDT found at this site is due to the deposition of sediments with high DDT contents at a point of sluggish flow. Sediments which precipitated from collected water samples contained about three times as much total DDT as the bottom sediments from the same site; in a water sample from which no sediment precipitated upon standing, the total value of DDT + derivatives was 31 ppt, which coincided with earlier measurements. The majority of the DDD + derivatives was transported as *p,p′*-DDT.

72-1418. Zitko, V.; Hutzinger, O.; Jamieson, W. D.; Choi, P. M. K. (Fisheries Research Board of Canada, Biological Station, St. Andrews, N.B., Canada). **Polychlorinated terphenyls in the environment.** *Bull. Environ. Contam. Toxicol. 7(4): 200-201; 1972.* (5 references)

Industrial applications of polychlorinated terphenyls (PCTs) are similar to those of polychlorinated biphenyls (PCBs). Mixtures of PCTs and PCBs are also sold. Though PCTs are not eluted from GLC columns under conditions used for analysis of PCBs, a method of PCT determination has been described (see Abstract No. 72-0218). The level of PCT in subcutaneous fat and eggs of herring gulls (*Larus argentatus*) from Bay of Fundy was found to be 1.4 and 0.1 μg/g, respectively, expressed as Aroclor 5460 on a wet-weight basis. PCTs were not detectable in eggs and fatty tissue of double-crested cormorants (*Phalacrocorax auritus*) from the same area.

72-1419. Munson, T. O. (Westinghouse Ocean Research Lab., Annapolis, MD). **Chlorinated hydrocarbon residues in marine animals of Southern California.** *Bull. Environ. Contam. Toxicol. 7(4): 223-228; 1972.* (6 references)

As part of a study dealing with sources of organochlorine pollution in Southern California's nearshore waters, it was necessary to find a good "indicator" organism for comparing organochlorine contamination at various areas. Hexane-acetone extracts from fish, mollusc, crustacean, and echinoderm tissues collected in the vicinity of the San Diego and Laguna Beach sewer outfalls were analyzed for polychlorinated biphenyl and total DDT content. Residue levels of total DDT ranged from indeterminable for red abalone at San Diego to 0.83 ppm for pyloric ceca of rockfish from San Diego. Values in fish livers averaged 0.3 ppm, and in mollusc and echinoderm tissues 0.6 ppm. Polychlorinated biphenyl residues ranged from undetectable in red abalone from San Diego to 1.4 ppm in spiny lobster digestive gland from Orange County. Despite the preliminary nature of the findings, it seems reasonable to conclude that Kellet's whelk would make a suitable indicator organism due to its widespread distribution, sessile habits, small size, and regular life cycle. Specimens of Kellet's whelk from Orange County contained 0.077 ppm total DDT and 0.23 ppm of polychlorinated biphenyls.

72-1420. Fries, G. F.; Marrow, Jr., G. S.; Gordon, C. H. (Animal Science Research Div., U. S. Dept. of Agriculture, ARS, Beltsville, MD 20705). **Similarity of a polychlorinated biphenyl (Aroclor 1254) and DDE in rate of elimination from cows.** *Bull. Environ. Contam. Toxicol. 7(4): 252-256; 1972.* (7 references)

Cows were inadvertently contaminated with DDT when grazing on land having high DDT soil levels. Just prior to removal of cows from the DDT source, the residues in milk fat were about 15 ppm, with a DDE/DDT ratio of 5:1. The cows were then fed corn silage from a silo later established as the source of polychlorinated biphenyls (PCBs). A cow having no DDT residues in its fatty tissue was introduced to the herd; later the herd was switched to a silage containing no PCBs. The PCB concentration in the milk fat of the clean cow rose rapidly after PCB feeding started, reaching 10 ppm within one month; PCB feeding was then stopped. The PCB concentration in the milk fat declined to 4 ppm in one month, and then continued to drop gradually, remaining above 2 ppm for the next 2 months. The elimination curve obtained was similar to that of a previous study dealing with reduction of DDE levels in milk after removal from the DDT source. In the present study, the first-order rate constants were identical for DDE and PCB reduction (the more slowly excreted, more highly chlorinated PCB component is rate determining) in milk fat from contaminated cows. The slope of the regression line for DDE and PCB loss is practically equal to unity.

72-1421. Ercegovich, C. D.; Witkonton, S.; Asquith, D. (Dept. of Entomology and Pesticide Research Lab., The Pennsylvania State U., University Park, PA 16802). **Disappearance of *N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine from six major fruit crops.** *J. Agr. Food Chem. 20(3): 565-568; 1972.* (28 references)

Samples of six major fruit crops which had been treated with varying amounts of *N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine (chlordimeform) were analyzed at various intervals to determine the total residue of this new insecticide they contained. At harvest, apples which had been treated with 48, 72, and 96 oz a.i./acre had residues of 0.06, 0.13, and 0.27 ppm, respectively. Pears treated with 48, and 96 oz a.i./acre had residues of 0.24 and 0.94 ppm, respectively. Plums treated with 48 oz a.i./acre had residues of 1.03 ppm. Cherries treated with 64 and 128 oz a.i./acre had residues of 0.23 and 0.74 ppm, respectively. Peaches treated with 32 and 64 oz a.i./acre had residues of 0.89 and 1.92 ppm, respectively. Strawberries treated with 8 oz a.i./acre had residues of 0.04 ppm. These findings reveal that the amount of total residue of chlordimeform on the various fruit was directly related to the amount of chemical applied, an inverse function of the number of days the fruit was sampled after the last application and was influenced by the nature of the fruit surface. (Author abstract reprinted by permission of the American Chemical Society)

72-1422. Witkonton, S.; Ercegovich, C. D. (Pesticide Research Lab. and Dept. of Entomology, The Pennsylvania State U., University Park, PA 16802). **Degradation of *N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine in six different fruit.** *J. Agr. Food Chem. 20(3): 569-573; 1972.* (32 references)

Samples from plants which had been treated with varying rates of *N'*-(4-chloro-*o*-tolyl)-*N,N*-dimethylformamidine (I) (chlordimeform, Galecron, or

Fundal) were analyzed for residues of the parent compound and three anticipated degradation products at various intervals after the last application. Only I and one major degradation product, 4′-chloro-*o*-formotoluidide (III), were detected in any of the samples. Fruit having low residues of I (apples, pears, and cherries) also had low residues of III, while plums and strawberries had higher residues of both chemicals. Peaches were an exception to either case since they had the highest amount of I but very low residues of III. No correlation existed between the amounts of I and III to such variables as amount of chemical applied or sampling interval. The nature of the fruit and environmental factors were accredited as the governing factors affecting the formation and retention of III in the fruit samples. Both I and III disappeared readily from treated fruit, thus resulting in less than 1 ppm of total residue in all crops at harvest, except peaches, which had approximately 2 ppm of total residue. The chief factors which appeared to account for these decreases were weathering and growth dilution, rather than chemical or enzymatic degradation. (Author abstract reprinted by permission of the American Chemical Society)

72-1423. Kearney, P. C.; Plimmer, J. R. (Agricultural Research Service, Plant Science Research Div., U.S. Dept. of Agriculture, Beltsville, MD 20705). **Metabolism of 3,4-dichloroaniline in soils.** *J. Agr. Food Chem. 20(3): 584-585; 1972.* (13 references)

The recovery and formation of ^{14}C-3,3′4,4′-tetrachloroazobenzene (TCAB) increases as the concentration of ^{14}C-3,4-dichloroaniline increases logarithmically in Hagerstown silty clay loam. A number of products were isolated from soils receiving 1000 ppm and included two isomeric forms of TCAB, presumably the cis (I) and trans (II) forms. In addition to 3,4-dichloroaniline (DCA), a product (*m/e* 189) was isolated that resembled DCA in fragmentation pattern at lower masses. This product was identified as 3,4-dichloroformylanilide by synthesis and comparison of physical properties with the authentic sample. Formylation represents another mechanism by which the amino group of aniline is complexed in soils. (Author abstract reprinted by permission of the American Chemical Society)

72-1424. Su, G. C. C.; Zabik, M. J. (Dept. of Entomology, Pesticide Research Center, Michigan State U., East Lansing, MI 48823). **Photochemistry of bioactive compounds. Photolysis of *m*-(*N,N*-dimethylformamidine)-phenyl *N*-methylcarbamate hydrochloride in water.** *J. Agr. Food Chem. 20(3): 642-644; 1972.* (12 references)

The photolysis ($\lambda > 286$ nm) of *m*-(*N,N*-dimethylformamidine)phenyl *N*-methylcarbamate hydrochloride (I) was carried out in water at pH 3.1 and 7.1 at a concentration of 250 ppm. The photoproducts, after they were isolated and purified by two-dimensional TLC, were identified as *m*-formamidophenol (VI) (~60%), *m*-aminophenyl *N*-methylcarbamate (IV) (~25%), *m*-formamidophenyl *N*-methylcarbamate (III) (~10%), and *m*-hydroxyphenyl *N*-methylcarbamate (VIII) (~5%) by comparison of their infrared and mass spectra with their respective authentic samples. (Author abstract reprinted by permission of the American Chemical Society)

72-1425. Spencer, W. F.; Cliath, M. M. (USDA, Agricultural Research Service, Soil and Water Conservation Research Div., U. of California, Riverside, CA 92502). **Volatility of DDT and related compounds.** *J. Agr. Food Chem. 20(3): 645-649; 1972.* (17 references)

Vapor pressures of two isomers of DDT and some of their degradation products, measured by a gas saturation method, indicate that the *o,p′* isomers are more volatile than the *p,p′* isomers. The vapor pressure of *o,p′*-DDT is 7.5 times that of *p,p′*-DDT. At 30°C the atmosphere above a surface deposit of technical grade DDT contains approximately 62% *o,p′*-DDT, 16% *o,p′*-DDE, 14% *p,p′* and only 8% *p,p′*-DDT. When technical grade DDT is applied to moist soil at concentrations up to 20 μg/g, the atmosphere in and above the soil contains approximately equal quantities of *o,p′*-DDT and *p,p′*-DDT, but at higher concentrations the ratio of *o,p′*- to *p,p′*-DDT in the vapor phase increases. Dieldrin applied with DDT did not affect DDT vapor density and the interaction between *o,p′*- and *p,p′*-DDT was very slight. Air drying of soil reduced volatility of all compounds. The primary breakdown product of DDT, *p,p′*-DDE, has a higher vapor pressure than the original compound, *p,p′*-DDT, which indicates that much of the DDT now present in the soil may volatilize as DDE. (Author abstract reprinted by permission of the American Chemical Society)

72-1426. Leuck, D. B.; Bowman, M. C. (Entomology Research Div., ARS, U. S. Dept. of Agriculture, Tifton, GA 31794). **Persistence of residues of Dasanit and three of its metabolites in Coastal bermudagrass, forage corn, and corn silage.** *J. Econ. Entomol. 65(1): 257-260; 1972.* (11 references)

Coastal bermudagrass and forage corn were treated with Dasanit (fensulfothion), *O,O*-diethyl *O*-[*p*-(methylsulfinyl) phenyl] phosphorothioate, ec at 0.5, 1.0, and 2.0 lb/ai acre and sampled 0, 1, 7, 14, 21, and 28 days posttreatment. Quart-size glass-jar corn silage was made from the 1-day post-treatment sampling. Residue analyses showed a gradual oxidation in the field to the three metabolites (mostly P=S,SO_2 and P=O,SO_2). After 28 days of weathering, total residues remaining in grass and corn treated at the highest level (5.96 and 2.80 in. of rainfall, respectively) were about 4 and 7 ppm (wet basis), respectively. In the corn-silage tests, the residues were essentially stable during a 30-day aging period held at 85°F. (Author abstract by permission)

72-1427. Smith, F.; Corley, C. (Entomology Research Div., ARS, U.S. Dept. of Agriculture, Beltsville, MD 20705). **Mexican bean beetle, yields and residues of malathion sprays on snap beans.** *J. Econ. Entomol. 65(1): 288-289; 1972.* (4 references)

Snap bean plants in the first trifoliate stage were sprayed with malathion in order to destroy adult Mexican bean beetles emerging from hibernation and hatching larvae. After five additional malathion applications over a one-month period, snap beans were harvested for zero-day residue analysis; one-day residue analysis samples were also taken. Harvested beans were analyzed for residues of malathion and malaoxon by gas chromatography with a flame photometric detector, used in the phosphorus mode to minimize cleanup. The zero-day residue on the treated beans was 0.80 ppm of malathion, and the one-day residue, 0.48 ppm. No malaoxon was detected.

72-1428. Saha, J. G. (Canada Agriculture Research Station, University Campus, Saskatoon, Saskatchewan, Canada). **Residues in seedlings of ten wheat varieties grown in dieldrin-treated soil.** *J. Econ. Entomol. 65(1): 302-303; 1972.* (5 references)

Elstow Chernozem soil, a clay loam soil, was mixed with dieldrin solution to give an initial dieldrin concentration of 12 ppm. Seeds of ten different wheat varieties were then planted in pots of this soil. Six of the varieties were red spring wheats, two were durum, and two were winter wheats. After 35 days, the seedlings were harvested by cutting 1 in. above the soil surface, and were analyzed for dieldrin content by electron-capture gas chromatography. The dieldrin level in the soil at the time of harvest was 9 ppm, and the dieldrin content of the seedlings ranged from 0.45 to 0.52 ppm, averaging 0.49 ppm. Analysis of variance revealed no significant difference in dieldrin levels among the ten varieties of wheat.

72-1429. Soedergren, A. (Dept. of Animal Ecology, Ecology Bldg., U. of Lund, S-223 62 Lund, Sweden). **Chlorinated hydrocarbon residues in airborne fallout.** *Nature (London) 236(5347): 395-397; 1972.* (21 references)

Six stations in south Sweden, mainly in agricultural areas, were monitored for airborne chlorinated hydrocarbons. Nylon nets (200 μm) impregnated with silicone oil and exposed for 2 to 3 mo were used for collection. Wind direction was most frequently west to southwest, bringing airborne material from the industries along the Swedish west coast, Copenhagen and West Germany. High PCB (polychlorinated biphenyl) levels were found at the western stations and the level recorded west of a municipal disposal plant was lower than one obtained in an agricultural region further down the coast. The distribution of DDT and DDE was more uniform. Since the use of DDT has been restricted for two years, its source is unclear, although long term volatilization from the soil could be a factor.

72-1430. Masuda, Y.; Kagawa, R.; Kuratsune, M. (Daiichi Coll. of Pharmaceutical Sciences, Fukuoka, Japan). **Polychlorinated biphenyls in carbonless copying paper.** *Nature (London) 237(5349): 41-42; 1972.* (7 references)

Polychlorinated biphenyls (PCBs) are widely distributed in the environment, and may enter the human body by a variety of routes, causing disturbing or serious symptoms when present in sufficient concentration. One of the many industrial uses of PCBs is the manufacture of carbonless copying paper. To estimate how much PCB sticks to the fingers when handling such paper, the authors counted three sets of upper, middle and lower sheets, each consisting of 32 precut sheets of the same size. The fingers were then washed once with 20 ml of *n*-hexane and the PCB contents of the washings determined by gas chromatography. The PCB quantities recovered ranged from 11.40 to 56.28 g, averaging 30.22 g, in five subjects. Only one-third of the PCB picked up was removed by ordinary hand washing, and therefore it is possible for the remainder to be absorbed through the skin. Since PCB residues are difficult to remove once accumulated, the authors conclude that the use of PCBs in carbonless copying paper should be discontinued.

72-1431. Polizu, A.; Floru, S.; Paulian, F. (Research Inst. for Plant Protection Bd. Ion Ionescu de la Brad, no. 8, Bucharest, Romania). **Translocation and distribution of heptachlor, aldrin and dieldrin in the corn plant.** *Qual. Plant. Mater. Veg. 20(4): 329-339; 1971.* (19 references)

An investigation of heptachlor uptake in corn indicated that the compound was absorbed in large amounts at first (3738 μg at 45 days before harvesting) and smaller amounts as the season progressed. Experiments conducted for two summers showed that the rate of plant development affected uptake. Translocation in both directions from the site of injection was noted; residues in the corn kernels were between 2 and 72% of the amount in the plant, and heptachlor epoxide was found. Aldrin had the next highest accumulation and there was evidence that it was partially transformed to dieldrin. Translocation and localization were stage-dependent. Uptake was the highest with dieldrin although it was not as evenly distributed as the former insecticides, resulting in lower levels in the kernels. Differences in vapor pressure could account for some of the differences in accumulation, resulting from volatilization of the compounds on leaf surfaces.

72-1432. Anonymous. **Farmers find drug residues are costly.** *Wallaces Farmer 97(7): 93; 1972.*

At the American Pork Congress in Kansas City,

Bernard Ebbing, director of hog procurement for a meat packing company, discussed cases where improper use of pesticides or drugs by farmers and feed formulators reduced the sale value of hogs. In one incident, a U.S. Dept. of Agriculture meat inspector found unacceptably high heptachlor levels in hogs. The source of the heptachlor was difficult to trace, since the farmer involved denied using insecticides on his pastures. When the components of the feed supplement were analyzed, high heptachlor levels were found in alfalfa meal. The company from which the farmer had purchased the product had sprayed its field with heptachlor to increase leaf yield and give higher protein and vitamin contents. Ebbing recommends a quarantine system for isolation of animals with drug residue problems, similar to that employed for isolating animals with infectious diseases.

72-1433. Randolph, N. M.; Teetes, G. L. (Texas Agricultural Experimental Station, College Station, TX 77843). **Residues from chemical treatment of grain sorghum.** *Texas Agr. Exp. Sta. Prog. Rep. PR 2941: 41-45; 1971.*

About 60% of the dimethoate, ethion, and azinphosmethyl dissipated from treated sorghum plants in 3 days, and less than 10% remained after 14 days. Methyl parathion had a residual of only 10% after 3 days. All of the organophosphates dissipated more rapidly from forage than from grain, and residues below 1 ppm seemed to dissipate at a slower rate. Ultra low volume application yielded higher, but perhaps less consistent deposits than normal application and residues dissipated at a slower rate. In general, there were no significant differences in yield between sorghum plants treated with 0, 1, and 2 applications of methyl parathion or parathion at 0.25 and 0.5 lb/acre at head emergence, although differences in discoloration among plants were evident. Soil residues of aldrin, heptachlor, endrin, dieldrin, and diazinon varied from 0.021 to 0.045 ppm in the upper 6-in. soil level of rotation plots and from 0.033 to 0.079 ppm in continuous sorghum plots 5 yr after soil treatment at 1.6 lb/acre. The chlorinated hydrocarbons did not move far from the area of placement. There was no detectable insecticide residue in forage or grain grown on dry land plots, while dieldrin and heptachlor epoxide were detected in forage grown in irrigated plots.

72-1434. Vorob'yeva, N. M.; Lapchenko, V. S. (Inst. Nutritional Hygiene, Kiev, USSR). **Toksikologo–gigiyenicheskaya otsenka antio. [Toxicological and hygienic evaluation of antio.]** *Zashch. Rast. (Moscow) 16(6): 38-39; 1971.* (Russian)

Residues of antio (formothion) in apples and pears were determined following a single application of a 0.2% aqueous emulsion of the pesticide. Two different apple varieties contained 3.15 and 2.32 mg/kg of formothion respectively, one day after treatment, and 0.93 and 0.66 mg/kg respectively five days after treatment. Pears contained 4.64 mg/kg one day after spraying and 1.64 mg/kg of formothion five days after spraying. None of the fruits contained traces of formothion 9 or 14 days after spraying. No trace of pesticide was detected after apples containing 0.2 to 0.5 mg/kg of formothion were heated to 80 to 100°C, as in canning. These data made it possible to establish the permissible limit of formothion in agricultural commodities as 0.2 mg/kg. Application of 0.2% formothion emulsions at 1.5 to 3.0 kg/ha is recommended, and fruit should not be harvested sooner than 14 days after the last application.

72-1435. Watson, M.; Gabica, J.; Benson, W. W. (Pesticide Community Studies Div., Pesticides Office, Environmental Protection Agency, Boise, ID). **Serum organochlorine pesticides in mentally retarded patients on differing drug regimens.** *Clin. Pharmacol. Ther. 13(2): 186-192; 1972.* (15 references)

Mentally retarded patients at an Idaho state institution received essentially identical diets, reflecting the levels of pesticide contamination of foodstuffs in the area. Serum specimens (three specimens taken at three month intervals, results averaged) from control patients (taking no drugs) contained *p,p'*-DDE in all instances, at an average level of 31.2 ppb. Most (97.8%) of these specimens also contained *p,p'*-DDT, averaging 5.1 ppb. The serum *p,p'*-DDE level in patients receiving phenobarbital alone averaged 6.8 ppm, and the *p,p'*-DDT content, 0.7 ppb. In patients receiving diphenylhydantoin alone, *p,p'*-DDE averaged 5.3 ppb and *p,p'*-DDT, 0.9 ppb. Patients receiving the combination of phenobarbital plus diphenylhydantoin displayed very low average serum concentrations of *p,p'*-DDE (1.6 ppb) and *p,p'*-DDT (0.1 ppb); in addition, *p,p'*-DDT occurred in only 40.0% of the patients in this group. Patients receiving drug regimens corresponding to the above but with the addition of miscellaneous tranquilizers and sedatives, displayed average pesticide levels slightly below those in the corresponding group. For all of the drug classes combined, the serum *p,p'*-DDE level averaged 7.4 ppm, and *p,p'*-DDT, 1.1 ppm. Possible explanations for the lowered pesticide residues include induction of hepatic microsomal drug-metabolizing enzymes and competition for serum protein binding sites.

See also 72-1357 72-1372 72-1438 72-1443 72-1449 72-1469 72-1472 72-1492 72-1502 72-1503 72-1504 72-1516 72-1537 72-1544 72-1547 72-1548 72-1554 72-1557 72-1564 72-1577 72-1582

72-1436. Paulson, G.; Vergara, G.; Young, J.; Bird, M. (Div. of Neurology, Ohio State U. Hospital, Columbus, OH 43210). **Thallium intoxication treated with dithizone and hemodialysis.** *Arch. Intern. Med. 129: 100-103; 1972.* (11 references)

Diagnosis and treatment of a patient afflicted with thallitoxicosis was discussed. Peripheral neuropathy was manifested in each member of the patient's family and those who survived had pathognomonic alopecia. Initial diagnoses included Guillain-Barre syndrome and hysterical hyperventilation syndrome. One family member had thallium in her urine and feces and a black band at the base of her scalp. She was treated with dithizone, KCl or charcoal, and a combination of them for a period of three weeks; it was difficult to determine which agent was most helpful. Hemodialysis, performed for eight hours, removed most of the thallium excreted in a 24-hr urine sample, but was considered of dubious benefit as hemolysis and severe postural hypotension followed treatment. Recovery was considered complete within a year.

72-1437. Kramer, J. P. (Dept. of Pediatrics, Wilmington Medical Center, Wilmington, DE). **Acute parathion poisoning in an adolescent.** *Del. Med. J. 44(2): 31-35; 1972.* (15 references)

Some of the important principles in treatment of organophosphate poisoning were demonstrated in a case of occupational parathion poisoning. The 16-yr-old male victim had symptoms of nausea, headache, and visual distrubance. Prior to the diagnosis of poisoning, prochlorperazine and valium were administered, and assistance in ventilation provided. Upon admission to the Medical Center, the patient was treated with atropine and protopam chloride, a systemic anticholinesterase antidote. Ventilation was assisted periodically for 5 days and recovery followed in 14 days. This case illustrated that a history of exposure is most essential for accurate diagnosis, and that laboratory values for cholinesterase or pseudocholinesterase should be used only as confirmatory evidence. Upon contact with parathion, areas should be immediately washed with 95% alcohol as washing with soap and water does not sufficiently prevent absorption. In treatment, medications depressing cholinesterase activity should be avoided (e.g. phenothiazines, chlordiazepoxide, barbiturates, meprobamate, and reserpine). Finally, sustained treatment is necessary following parathion poisoning because, unlike TEPP and paraoxon, it is not an immediate cholinesterase inhibitor but must be converted in the liver to an active form. After recovery patients should be warned to avoid exposure until cholinesterase levels return to normal or at least for four to six months in the case of serious parathion intoxication.

72-1438. Faber, R. A.; Risebrough, R. W.; Pratt, H. M. (Dept. of Wildlife Ecology, U. of Wisconsin, Madison, WI 53706). **Organochlorines and mercury in common egrets and great blue herons.** *Environ. Pollut. 3(2): 111-122; 1972.* (36 references)

Eggshells of common egrets (*Casmirodius albus*) and great blue herons (*Ardea herodias*) were collected from the floor of a nesting area in Northern California. Dead nestlings and adults were also collected. Hatched eggshells were distinguished from broken eggshells by absence of dried albumin or yolk and other criteria. On the average, broken eggshells from both bird species were 17% thinner than pre-1947 museum specimens. Yolk lipids from a broken egret egg contained 248 ppm DDE, 285 ppm total DDT, and 40.3 ppm PCB. Whereas most of the great blue heron eggs survived incubation, 54% of the nesting attempts of the common egrets suffered egg loss. The number of young egrets fledged per breeding pair dropped from 1.4 in 1967 to 1.0 in 1970. Concentrations of *p,p'*-DDT + TDE in brains of adult birds found dead or dying without apparent injury averaged 2.1 ppm; DDE 59.7 ppm; PCB, 9.7 ppm; and dieldrin, 4.36 ppm. Mercury in the livers of these birds averaged 6.08 ppm. The DDT:PCB ratios indicated that the majority of the pesticide contamination was acquired in the birds' wintering areas in Southern California; however, the sources of dieldrin and mercury are unknown.

72-1439. Imaizumi, K.; Atsumi, K. (Dept. of Ophthalmology, Iwate Medical College, Japan). **[Eye lesions due to agricultural chemicals.]** *Ganka (Ophthalmology) 13(7): 717-724; 1971.* (36 references) (Japanese)

Ocular damage resulting from organophosphate and organochlorine poisoning is reviewed, and some actual cases are presented. The main symptoms of organophosphate poisoning involve miosis, corneal ulceration, narrowing of vision, nystagmus and difficulty in accomodation, astigmatism, impaired vision, and EEG abnormalities. Organochlorine damage usually includes conjunctivitis and corneal opacity, which are rapidly cured. However, acute poisoning by PCP is more serious, usually leading to death, and leaving survivors with impairments in autonomic function and circulation, visual damage, and an arcuate type of scotoma. Other PCP damage involves acute inflammation of the conjunctiva and characteristically shaped superficial corneal opacity, corneal numbness, and slight mydriasis. *N*-Tetrachloroethylthiotetrahydrophthalimide, often used in orchards, causes skin inflammations, and no eye damage has been reported aside from the author's findings of tenonitis, conjunctivitis, swelling and slight protopsis. Endrin causes severe acute poisoning, with symptoms of cyanosis, breathing difficulty, coreadiastasis, convulsions of the entire body, and loss of consciousness; mortality is high. Aside from the author's findings of gradual loss of vision, eye impairment has not

been reported. Mercury pesticide poisoning results in the Hunter-Russell symptoms, speech impediment, loss of hearing, disorders of kinetic senses, and a narrowing of vision.

72-1440. McIntyre, A. R. (Dept. of Pharmacology, U. of Nebraska Medical College, Omaha, NB). **The toxicities of mercury and its compounds.** *J. Clin. Pharmacol. J. New Drugs 11(6): 397-401; 1971.* (24 references)

The toxicity of mercury, its salts and its organic compounds is discussed. Although metallic mercury seems relatively non-toxic, the vapor can be quite toxic. This is probably a result of oxidation in the bronchi and circulation of the ionized form. The effects of mercury salts include damage to the mouth and gut, violent gastritis and pain, vomiting, bloody diarrhea, dehydration, shock, and death or delayed death from renal failure. Many mercurials, including methyl mercuric nitrate, methyl mercuric iodide and methyl mercury guanidine are much more toxic than would be expected from their mercury content; symptoms of poisoning are limited to the nervous system. Experience with poisoning from mercury-containing fungicides indicates that there is a wide variation in susceptibility among individuals. Hair content of mercury seems to correlate with susceptibility.

72-1441. Roberts, D. V.; Taylor, K.; Wilson, A. (Dept. of Physiology, U. of Liverpool, Liverpool L69 3BX, England). **Effects on neuromuscular function of acute and chronic exposure to cholinesterase inhibitors in man and in the rat.** *J. Physiol. (London) 219(2): 15P; 1971.*

The effects of exposure to anticholinesterase compounds on neuromuscular function were studied in three test groups: human myasthenia gravis patients given optimal and excessive amounts of neostigmine and pyridostigmin; industrial pesticide-manufacturing workers; and rats given either a single subcutaneous dose of DFP or subcutaneous doses of neostigmine daily for 3 to 4 wk. Electromyography was employed in detecting both facilitatory and depressant anticholinesterase effects on neuromuscular transmission in man. Results obtained from overtreated myasthenic patients and workers exposed to cholinesterase-inhibiting pesticides are compared. Conventional microelectrode techniques were employed for measuring acetylcholine store and release in the rat.

72-1442. Muro, T.; Shimada, Y.; Yano, Y.; Mozai, T. (Dept. Internal Med., Tokyo U. Med. School, Tokyo, Japan). **[Neuropathy caused by organophosphates and organochlorines.]** *Naika (Intern. Med.), 28: 509-519; 1971.* (73 references) (Japanese)

Cases of neuropathy resulting from organophosphate and organochlorine poisoning are reviewed, with specific reference to a case of multiple neuropathy caused by diazinon. The patient had been repeatedly using diazinon solution, 10 bottles of 5% liquid (500 ml each), for disinfecting compost storage. The main symptom was dysesthesia in the legs, with additional symptoms of stomach and liver disorders and constant fatigue, which were still present seven years after the initial diagnosis. In the case reviews presented, photographs of microscopic findings and fungi are included. Acute poisoning by organochlorines in man and animals generally creates symptoms such as high fever, agitation, instability, twitching of eyelids, tic, muscle spasms of the entire body, trembling, mydriasis, and respiratory paralysis or ventricular fibrillation leading to death. Characteristically, histological findings in organs are extremely limited. Chronic poisoning symptoms are weight loss, loss of appetite, deterioration of muscle control, and trembling; death may result from causes similar to those in acute poisoning. While chronic organophosphate poisoning has not been reported as fatal, various symptoms resulting from its use have been noted.

72-1443. Koeman, J. H.; Rijksen, H. D.; Smies, M.; Na'isa, B. K.; MacLennan, K. J. R. (Inst. of Veterinary Pharmacology and Toxicology, Utrecht, The Netherlands). **Faunal changes in a swamp habitat in Nigeria sprayed with insecticide to exterminate *Glossina*.** *Neth. J. Zool. 21(4): 434-463; 1971.* (33 references)

The Ngejis of Northeastern Nigeria are areas of dense forest growth along river courses that form habitats for tsetse flies (*Glossina* spp.) as well as many birds and animals. Some of these areas were treated with a single application of dieldrin mist in 1969. Birds, mammals, amphibians and fish were counted before and immediately after spraying, as well as one year later. Dead animals found within 10 days after spraying were collected and analyzed for chlorinated hydrocarbon residues. Animals found dead included numerous birds and fish, and some skinks. Calculation of prominence values revealed significant reductions from 1969 to 1970 in the numbers of some insectivorous bird species, particularly the white crowned robin chat and the blue breasted kingfisher. Dieldrin levels in the brains of birds found dead or dying within one month after spraying ranged for 2.2 to 16 ppm. Brain levels in two healthy bird specimens were 0.3 and 1.7 ppm. As much as 15 ppm dieldrin was found in the livers of dead fish. One year later, residue levels had declined by at least one order of magnitude. Tree bark samples taken in 1970 contained 0.01 to 3.7 ppm dieldrin and 0.02 to 3.0 ppm photodieldrin.

72-1444. Nakamura, R.; Kusuki, T.; Mori, S.; Kanemitsu, J.; Kakimoto, S.; Takano, T.; Tsuda, T.; Kishikawa, J. (Nagasaki Wakame kai, Japan). **[Myopic tendency induced by agricultural chemicals and its treatment.]** *Nippon Ganka Kiyo (Folia Ophthalmol. Jap.) 22: 584-598; 1971.* (5 references) (Japanese)

The records of elementary and secondary school pupils of Shimabara City (Nagasaki Prefecture) were examined in order to determine the proportion of myopia in the total school population for the years 1962 to 1970. In all schools, the ratio of children with poor eyesight to those with good vision generally increased, especially for girls. However, in 1965 and from 1969 to 1970 there was a decrease which may be accounted for by changes in the use of agricultural chemicals. In 1965 toxic organophosphates were replaced by less toxic preparations and in 1970 the use of BHC was prohibited. Out of 253 outpatient cases, 76 children having myopia and astigmatism and also showing signs of pesticide injury (between December 1970 and April 1971), received follow-up examinations and treatments. Visual examinations, serum cholinesterase level, and liver function tests were carried out. The 76 children were divided into three groups: A. normal visual field; B. slight abnormality in visual field with 40 to 60 degree centrifugal narrowing; C. marked abnormality in visual field. Following combinations of therapy with pyrodiphenium bromide and 2-mercaptopropionylglycine, marked improvements were found in visual acuity and visual field, especially for those children who had suffered from narrowing of vision. Changes in skiascopic results were not as notable as improvements in visual acuity and field.

72-1445. Sare, W. M. (Te Awamutu, New Zealand). **Chronic poisoning by a phosphate ester insecticide, malathion.** *N. Z. Med. J. 75(477): 93-94; 1972.* (5 references)

A 25-year-old man sought medical aid for malathion poisoning when he began to notice symptoms of fatigue, visual disturbance, headache, nausea, and twitching. At his work in a garden shop he was exposed to potent malathion for several hours a day. The only therapeutic measure applied involved limiting exposure to malathion fumes for several hours a day. The only and encasing the small packets of malathion on the countertop in double plastic bags. A single plastic bag did not prevent malathion odor from penetrating into the shop atmosphere. Over a four-week period the symptoms gradually disappeared, accompanied by a rise in red blood cell cholinesterase from 0.7 to 1.1 units and in plasma cholinesterase from 0.5 to 1.3 units. The symptoms and recovery of the patient fit the classical pattern of organophosphate poisoning, which results in accumulation of acetylcholine and alteration of neuromuscular function.

72-1446. Gardiner, A. J. S. (Aberdeen Royal Infirmary, Foresterhill, Aberdeen AB9 2ZB, Scotland). **Pulmonary oedema in paraquat poisoning.** *Thorax 27: 132-135; 1972.* (14 references)

After accidental ingestion of Gramoxone (paraquat), a 47-yr-old man developed lesions of the mouth and esophagus, hepatic and renal damage and, at an earlier stage than is usual, pulmonary edema. None of the symptoms were apparent until 34 hr post ingestion. Treatment consisted of forced diuresis for 6 hrs, symptomatic administration of analgesics and ampicillin, and administration of large doses of oral corticosteroids. Recovery, which has not been reported in cases of paraquat poisoning in which pulmonary dysfunction was observed, followed in about 10 days. Reviewed at 3 mo, the lungs showed no clinical or radiographic abnormality.

72-1447. Anonymous. **Symptoms of mild pesticide poisoning.** *Wallaces Farmer 97(7): 57; 1972.*

David L. Mick, of the Iowa Community Pesticides Study at the University of Iowa, is gathering information from farmers on symptoms and treatment involved in overexposure to pesticides. He is seeking to establish some of the problems of overexposure, promote safer use of these chemicals, and find better treatment methods for poisoning. Symptoms are often similar to those of the flu and include: headache, nervousness, weakness, dizziness, nausea, cramps, diarrhea, discomfort in the chest and blurred vision. Excessive sweating, tears, or saliva flow and convulsions, coma and loss of reflexes are symptoms which also might indicate pesticide poisoning.

72-1448. Anonymous. **The household environment. 3. Garden chemicals.** *Your Environ. 2(3): 133-135; 1971.* (3 references)

Garden chemicals selected non-systematically at a corner shop in North London differed in adequacy and straightforwardness of labeling. Two of the preparations were herbicides, two insecticides, and one an ant killer of "secret Japanese formula". Although the active ingredients of the four British preparations appeared on the list of Approved Products for Farmers and Growers of the Ministry of Agriculture, the labels did not display all of the precautions expressed in this list. Statements on the toxicity of simazine, lindane and DDT to fish, and recommendations for preventing contamination of waterways were conspicuously absent from the labels. Self-contradictory labeling instructions were quite misleading in the case of a preparation containing lindane and menazon. It was described as "harmless to people and pets when used as directed", while the directions included an instruction to "keep away from fish, bees and pets". Because of the inadequacy of labeling and the destruction of beneficial organisms along with harmful ones, home gardeners are advised to use garden chemicals with caution.

72-1449. Hays, H.; Risebrough, R. W. (Dept. of Ornithology, American Museum of Natural History, Central Park West, 79th St., New York, NY 10024). **Pollutant concentrations in abnormal young terns from Long Island Sound.** *Auk 89(1): 19-35; 1972.* (33 references)

A detailed productivity study was made of common and roseate terns on Great Gull Island, N. Y., during 1969 and 1970. The incidence of abnormal roseate tern chicks was 2/971 in 1969 and 5/806 in 1970. For the common tern the figure was 1/2,089 in 1969 and 35/2,316 in 1970. Eye, bill and foot deformities as well as feather loss and failures to hatch were observed. In 1970, abnormal young and fish brought by adult birds to the colony were analyzed for polychlorinated biphenyls (PCB), DDT and, in some cases, mercury. Liver mercury levels in young terns ranged from 0.2 to 1.2 ppm. Breast muscle contained a median concentration of 2.1 and 25 ppm wet weight of DDE and PCB, respectively. Median concentrations of 0.19 and 1.0 ppm wet weight of DDT compounds and PCB, respectively, were found in fish collected. Observed abnormalities were similar to those induced in chickens by chlorinated dibenzo-*p*-dioxins and some PCB preparations.

72-1450. Hiraki, K.; Iwasaki, I. (School of Internal Medicine, Okayama U., Shikada-machi, Okayama-shi, Japan). **[Cases of organophosphorus poisoning treated with PAM and investigation of effectiveness of PAM.]** *Baioteku (Biotech) 3(5): 354-360; 1972.* (14 references) (Japanese)

PAM treatment was employed in five typical cases of parathion poisoning, one case of poisoning with EPN, and one with MHCP (*O*-methyl-*O*-cyclohexyl *S*-(4-chlorophenyl)thiophosphate), as well as a case of parathion neuropathy. Serum cholinesterase activities, inhibited by parathion, are rapidly restored by PAM. This restoration is accompanied by the disappearance of symptoms and improvement in general condition. In human poisoning cases, the serious symptoms such as myofibrillar spasms and loss of consciousness disappear about 30 minutes after PAM administration, while subjective symptoms such as headache, miosis and tachypnea persist. The adequacy of PAM administration is judged by restoration of serum and erythrocyte cholinesterase levels. To keep these at the desired values, repeated injections of PAM or a drip infusion are required. Simultaneous administration of atropine is also advisable, especially in the case of poisoning by newer organophosphates, such as MHCP, which does not respond well to PAM treatment. In one case described by the authors, complete recovery was attained by drip-infusion of 65 grams of PAM and a large amount of atropine within 16 days in a patient who had ingested 13 ml of 50% parathion emulsion concentrate.

72-1451. Sugaya, T. (Inst. for Rural Medicine, Hiraka General Hospital, Yokote-shi, Akita-prefecture, Japan). **[Therapy of poisoning by organochlorine insecticide.]** *Baioteku (Biotech) 3(5): 361-364; 1972.* (22 references) (Japanese)

The major effects of organochlorine pesticide poisoning involve the central nervous system, and consist of excitation, tremor and spasm. These symptoms are best combated by administration of phenobarbital. To minimize systemic absorption and storage, induction of emesis, gastric lavage and administration of saline purgatives are indicated. Aside from these measures, treatment in cases of systemic poisoning with organochlorines is largely symptomatic. Dermal contact with organochlorines primarily results in manifestations of hypersensitivity; however, erosions and ulceration can occur, and require appropriate treatment. ACTH-containing ointments are often beneficial. Eye injuries due to organochlorine pesticides are relatively infrequent. Eye drops containing substances related to ATP may aid in reversing chronic inflammatory changes. Case reports are presented in 3 incidents of systemic poisoning, 2 cases of skin injury, and 4 instances of eye injury due to organochlorine pesticides.

72-1452. Voytenko, G. A.; Burkatskaya, Ye. N.; Matyushina, V. I.; Dyadicheva, T. V.; Matokhnyuk, L. A.; Medved', I. L.; Pestova, A. G.; Aleksandrova, L. G.; Ivanova, Z. V.; Stepanchenko, N. G. (Inst. of Occupational Hygiene and Diseases, USSR Academy of Medical Sciences, Kiev, USSR). **Voprosy gigieny truda pri ispol'zovanii karbaminovykh pestitsidov. [Occupational hygiene problems involved in handling carbamate pesticides.]** *Gig. Tr. Prof. Zabol. 16(1): 4-8; 1972.* (7 references) (Russian)

Occupational safety studies were made on the handling of the carbamate pesticides carbyne (barban), dicresyl (dicresyl ether of *N*-methylcarbamic acid), diptal (diallate Avadex BV), eptam (EPTC; *S*-ethyl-*N,N*-di-*n*-propylthiocarbamate), yalan (molinate; *S*-ethylhexamethylene carbamate), and maneb. The following concentrations of pesticide were found in the air of the work area during the handling of the carbamates: 1.12-1.4 mg/m^3 barban; 3.4-43.4 mg/m^3 dicresyl; 2.7-4.6 mg/m^3 diallate; 12.6-21.0 mg/m^3 EPTC; 0.4-1.86 mg/m^3 molinate; and 0.012-0.39 mg/m^3 maneb. The unprotected skin could be exposed to pesticide deposits of 0.001-4.0 mg/cm^2. To promote occupational safety, EPTC should be used in granular rather than liquid formulations. Some workers reported headache and nausea following brief exposure to diallate or EPTC. Depressed cholinesterase activities were found in workers exposed to dicresyl. A 3-day safety period should be allowed before resuming work on fields treated with barban, diallate, EPTC, maneb or molinate. Fields treated with diallate, EPTC, molinate, or maneb should be surrounded by a 200-m untreated safety lane. A mask should be worn to protect the respiratory organs when handling diallate, dicresyl, tillam, barban, or EPTC.

72-1453. Ohto, K.(Asama City Hospital, Saku-Shi, Nagano Pref., Japan). **[Eye disease induced by organic phosphorus insecticides. Adult cases.]** *Nippon Ganka Gakkai Zasshi (J. Jap. Ophthalmol. Soc.) 75(8): 1944-1951; 1971.* (12 references) (Japanese)

Chronic organophosphate poisoning is endemic in the Saku district of Nagano prefecture due to heavy application of DDVP for mosquito control and parathion, diazinon, malathion and fenitrothion for crop protection. Ocular symptoms in children of this region have been reported elsewhere (see Abstract No. 72-0773). A variety of systemic and neurological symptoms, reduced serum cholinesterase, and liver function abnormalities were reported for 51 adult cases examined. Paranitrophenol was present in the urine and there were ocular symptoms which included choked disk, atrophic disk, spasms of the ciliary muscle, cataract, disturbance of the smooth pursuit motion of the eye, and miosis or mydriasis in severe cases. Treatment with PAM and atropine brought dramatic improvement in all visual symptoms, confirming the etiologic role of organophosphate poisoning in ocular symptomatology.

72-1454. Scripcaru, G.; Ghimicescu, C.; Cotrau, M.; Pastia, A.; Istrate, E.; Catuneanu, D. (Institutul Medico-Legal, Iasi, Rumania). **Criterii de evaluare a factorilor de risc in intoxicatiile acute. [Risk factor evaluation criteria in acute poisoning.]** *Rev. Med.-Chir. (Iasi) 75: 661-668; 1971.* (13 references) (Rumanian)

Pesticides were responsible for 35% of the acute poisonings which occurred in Rumania between 1964 and 1969. Most of these poisonings were classified by the Medico-Legal Institute as accidental. Out of 766 fatal poisonings, 301 were due to pesticides; specifically, parathion was the cause of death in 238 cases and organochlorines in 45. The kind of poison involved in a given accident is determined by the victim's milieu, which governs availability of poisons. Of the 766 cases discussed here, 43% occurred in agricultural and 30% in domestic environments and 2.6% in industrial areas, while 6.7% were of iatrogenic origin. An epidemiologic study of acute poisoning should include information on locale, occupation and age of the victim, as well as the nature of the poison, clinical symptoms, and proximate cause of death. A scientific study based on such data will aid in identifying risk factors for poisoning.

72-1455. Wangenheim, M.; Pasi, A.; Jenny, E. (Institut fuer Pharmakologie und Biochemie der Vet. Med. Fakultaet der Universitaet Zurich, Zurich, Switzerland). **Rodentizidvergiftungen bei Tieren in der Schweiz. [Rodenticide poisonings of animals in Switzerland.]** *Schweiz. Arch. Tierheilk. 113: 350-360; 1971.* (46 references) (German)

In Switzerland, 15 active rodenticidal ingredients are marketed in 95 formulations. These preparations were implicated in 95 incidents of animal poisoning reported to the Swiss Poison Information Center between April 1966 and April 1970. These incidents involved 84 dogs, 42 pigs, 5 cats, 3 calves, 2 horses and 1 hamster. Rodenticide ingestion was established in 118 of these animals and suspected in 24. Intoxication was diagnosed in 52 of the known cases and 8 of the suspected ones. Of the 60 poisoned animals, 36 survived, 17 died, and the outcome was unknown in 7. Coumarin and its derivatives, including warfarin, were responsible in 33 cases; zinc and calcium phosphides, 12; crimidine, 8; thallium (sulfate or acetate), 8; squill, 7; α-chloralose, 6; sulfur dioxide, 5; α-naphthylthiourea, 4; norbormide, 3; indanedione derivatives, 2; yellow phosphorus, 2; sodium fluosilicate, 2; sodium acetate, 1; calcium cyanamide, 1; and strychnine, 1. In Switzerland, preparations with similar trade names may have very different active ingredients, making it difficult to provide accurate toxicologic information and thus increasing their potential hazard.

72-1456. Luzhnikov, Ye. A.; Kosarev, V. A. (N. V. Sklifosovskiy Inst. Emergency Med., Moscow, USSR). **K voprosu ob osobennostyakh klinicheskogo techeniya ostrogo otravleniya fosfororganicheskimi insektitsidami (FOI). [Clinical features of acute poisoning with organophosphate insecticides.]** *Ter. Arkh. 43: 106-108; 1971.* (1 reference) (Russian)

After intentionally ingesting 100 ml of 30% chlorophos (trichlorfon) solution a 37-year-old man was admitted to the poison treatment center with miosis, bronchorrhea and bradycardia and a cholinesterase activity of 2.1 μmole/ml/min. Respiratory function improved rapidly after gastric lavage and atropine administration, but serum cholinesterase activity dropped to 0.5 μmole/ml/min. Acute relapses, including bronchospasm and cardiac arrest, occurred on the second and fourth days. After the second resuscitation, the bronchial tree was rinsed with a solution of sodium bicarbonate and antibiotics. For the next three days, the patient's condition was characterized by purulent tracheobronchitis, bilateral pneumonia, toxic polyneuritis, and a cholinesterase activity of 1.85 μmole/ml/min. The patient was released in satisfactory condition on the 47th day, with a cholinesterase level of 5.6 μmole/ml/min; 200 ml of atropine solution and 120 ml of a 15% dipyridoxime (cholinesterase reactivator) preparation had been given altogether. In organophosphate poisoning, cleansing the gastrointestinal tract may help prevent continued absorption. The amounts of antidotes administered should allow for enhanced losses due to forced diuresis.

72-1457. Barkov, A. M.; Glukhovets, B. I. (Central District Hospital, Konakovo, USSR). **Sluchay ostrogo otravleniya khlorofosom so smertel'nym iskhodom. [A case of acute chlorophos poisoning with fatal outcome.]** *Ter. Arkh. 43: 118-119; 1971.* (3 references) (Russian)

A case of fatal poisoning by chlorophos (trichlorfon) is presented. The patient died six hours after admis-

sion to the hospital, despite administration of atropine, oxygen, and the respiratory stimulants nikethamide, ephedrine and lobeline. Autopsy and histologic examination revealed hyperemia of the brain, gastric mucosa, pancreas, pleura and pericardium; dystrophic alterations of the liver, kidney, and myocardium; pulmonary emphysema; and spastic conditions of the urinary bladder and gastrointestinal tract. The diagnosis of trichlorfon poisoning was based on chemical analysis of cadaver specimens, which revealed the presence of a compound containing phosphorus and chlorine. Utilization of trichlorfon as an insecticide in the victim's household was ascertained.

72-1458. Chichikalo, D. I.; Gavryuk, A. P.; Popov, L. G. (Cherkassy Regional Sanitary and Epidemiological Station, Cherkassy, USSR). **Gigiyenicheskaya otsenka usloviy truda pri obrabotke zerna khlorpikrinom. [Hygienic evaluation of working conditions during seed treatment with chloropicrin.]** *Vrach. Delo 10: 139-141; 1971.* (Russian)

Chloropicrin contents of 1402 to 2777 mg/l were found in air samples taken above containers of treated seed; these values were two to three times the lethal dose for man. Ambient temperature during fumigation ranged from 16 to 18°C in summer and 8 to 16°C in the fall, when high relative humidities were also recorded. Chloropicrin contents of workers' clothing averaged 2782 and 5425 mg/kg under dry and humid conditions, respectively. The heavy gas masks worn by the workers impeded their mobility and prolonged exposure to the fumigant. All of the workers experienced eye irritation and complained of an unpleasant taste in the mouth, nausea, and loss of appetite. Handling chloropicrin is highly hazardous, and should be prohibited when the temperature is below 12°C or the relative humidity is high.

See also **72-1354** **72-1363** **72-1367** **72-1370** **72-1379** **72-1420** **72-1430** **72-1434** **72-1435**

72-1459. Lehotzky, K.; Bordas, S. (State Inst. of Occupational Health, Dept. of Applied Toxicology, Budapest, Hungary). **Urinary and serum transaminase levels in rats with organic mercury poisoning.** *Acta Med. Acad. Sci. Hung. 28(2): 139-143; 1971.* (9 references)

Urinary transaminase was studied in the rat as an indicator of minor tubular lesions induced by methoxyethyl mercuric chloride (MEMC). An increase in urinary glutamic oxaloacetic and glutamic pyruvic transaminases corresponded to an increase in cell count in the urine following MEMC-induced damage to the tubular epithelium. After administration of large doses of MEMC (2 mg/kg, six times weekly) serum transaminase levels also increased. The test requires only small amounts of urine, and is a convenient, specific method for demonstrating early tubular damage in chronic mercury poisoning.

72-1460. Lubberink, A. A. M. E.; Rijnberk, A.; Der Kinderen, P. J.; Thijssen, J. H. H. (Small Animal Clinic, State U., Yalelaan 4, Utrecht, The Netherlands). **Hyperfunction of the adrenal cortex: a review.** *Aust. Vet. J. 47(10): 504-509; 1971.* (15 references)

Hyperadrenocorticism in the dog may be caused by bilateral hyperplasia or an adrenal adenoma or carcinoma and is manifested by only one disease, Cushing's syndrome. Symptoms of the disease are polyuria, polyphagia, protein depletion, abdominal enlargement, alopecia, intolerance for a hot environment, anestrus in females, exophthalmos, poor wound healing and ostoeporosis. The onset of symptoms varies with the rate at which the syndrome is progressing and animals may die within 6 to 24 mo if untreated. Diagnosis requires determination of urinary 17-hydroxycorticosteroids. In man an isomer of DDD, *o,p'*-DDD, is used for treatment in cases of adrenocortical carcinoma. It has also been successfully used in treating bilateral hyperplasia in man, but not in the dog, where surgery is the treatment of choice.

72-1461. Miyamoto, J. (Research Dept. Pesticide Div., Sumitomo Chemical Co. Ltd., Osaka, Japan). **[Organophosphorus insecticides and environment.]** *Bochu Kagaku (Sci. Pest. Contr.) 36(3): 135-158; 1971.* (167 references) (Japanese)

This comprehensive review of organophosphate toxicity deals with the metabolic fate of these compounds in mammals as well as the physiological and chemical mechanisms of poisoning. Comparisons are made between the symptoms of acute, subacute, and chronic poisoning, and previously published results of animal experiments are published in tables. Toxicological methods used in obtaining these results are discussed; these include tracer techniques, autopsy, hematology, gross and micro anatomy, appearance, behavior, weight, diet, and chemical analyses. This review also deals with the effects on reproductive functioning of future generations, including mutagenesis and teratogenesis. Interactions between two or more pesticides are included. Due to the neurotoxicity of certain organophosphates, there is a section on the paralysis of the limbs.

72-1462. Day, M. D.; Hall, J. M.; Owen, D. A. A. (The Pharmacology Labs., Dept. of Pharmacy, U. of Aston in Birmingham, Birmingham B4 7ET, England). **Selective inhibition of angiotensin pressor responses in the pithed rat by tetraethylthiuram disulphide (disulfiram) and sodium diethyldithiocarbamate (DDC).** *Brit. J. Pharmacol. 44(2): 192-202; 1972.* (24 references)

Two distinct actions on angiotensin pressor responses were observed following administration of disulfiram (50 mg/kg) and sodium diethyldithiocarbamate (DDC) (5 to 100 mg/kg) in pithed rats. Responses to angiotensin were initially enhanced for 2 to 3 hrs, the maximum effect being observed at about 90 min. Responses to sympathetic stimulation and noradrenaline during this period were enhanced to a greater extent, and penicillamine and ascorbic acid had a similar effect. After 3 to 4 hr a specific inhibition of responses to angiotensin was observed after administration of DDC or disulfiram. Responses to noradrenaline, sympathetic stimulation or the octapeptide vasopressin were not significantly inhibited. Copper chelation may be responsible for the primary effect of the two compounds since other chelating agents had a similar effect, and may also be responsible for the delay in the second effect observed. Inhibition may be due to blockage of active sulfhydryl groups.

72-1463. Bostroem, S.-L.; Johansson, R. G. (Dept. of Zoophysiology, U. of Goeteborg, Fack, S-400 33 Goeteborg 33, Sweden). **Effects of pentachlorophenol on enzymes involved in energy metabolism in the liver of the eel.** *Comp. Biochem. Physiol. 41(2B): 359-369; 1972.* (24 references)

Enzymes representative of the main metabolic pathways were studied in the presence of pentachlorophenol (PCP) and following its absorption by yellow eels. Glycolytic enzyme activities were reduced after four days of PCP treatment, but activity levels were higher than those of controls after a 30-day recovery period. Enzymes of the pentose phosphate shunt, the citric acid cycle and the respiratory chain, and hexokinase, had higher levels of activity following PCP treatment; after the recovery period enzyme levels were still higher than those of controls. The enzymes were all inhibited *in vitro* at $10^{-3}M$ PCP. Soluble protein concentrations were found to increase about 15% after the treatment and recovery period.

72-1464. Rosival, L.; Cerey, K.; Ruttkayova, J.; Vargova, M.; Tildyova, K. (Akademiai Farmakologiai Intezet, Bratislava, Czechoslovakia). **Ujabb ismeretek a pesticidek toxikologiaja teruleten. [Recent achievements**

in pesticide toxicology studies.] *Egeszsegtudomany 16(1): 63-69; 1972.* (Hungarian)

Recent pesticide toxicology studies are reviewed. Daily peroral heptachlor doses of 1, 5, and 10 mg/kg body weight, administered to female rats for 17 days, resulted in shortened estrus (4.6 and 3.4 days, respectively). The gestation index for the second generation was significantly higher in the test group than in the control group, while it showed a considerable decrease for the third generation in the group treated with 10-mg doses. The vitality indices for offspring surviving for four days were lowest in the highest-dosage group, and lactation indices were decreased in the two highest-dosage groups. Reduced fertility was observed in both groups, and 5-mg doses produced fetal anomalies as well as causing a high rate of fetal resorption. Interactions between heptachlor and analgesics or sedatives were studied in male mice. Aminopyrine showed reduced toxicity when given 96 hours after intraperitoneal administration of heptachlor at 25 mg/kg body weight. Pentobarbital sleeping time was shortened at 96 and 192 hr after heptachlor treatment. Finally, mercuric chloride, given intraperitoneally at 5 mg/kg, caused liver damage and changed the LDH isoenzyme distribution pattern in rats.

72-1465. Dinamarca, M. L.; Levenbook, L.; Valdes, E. (National Inst. of Arthritis and Metabolic Diseases, National Inst. of Health, Bethesda, MD 20014). **DDT-dehydrochlorinase II. Subunits, sulfhydryl groups, and chemical composition.** *Arch. Biochem. Biophys. 147: 374-383; 1971.* (30 references)

Using several modifications of previously reported purification and assay procedures, DDT-dehydrochlorinase was purified from DDT-resistant houseflies, strain P_2/sel, for further characterization. Gel electrophoresis indicated that the tetramer (mol. wt. ~ 120,000) is stabilized by reducing agents and disaggregated by either β-mercaptoethanol or dithiothreitol. The monomers are not chemically or physically distinguishable and are converted to the active tetramer by DDT. The enzyme was found to contain 32 cysteinyl residues/tetramer within hydrophobic portions of the molecule, but disulfide bonds do not bridge the chains and sulfhydryls do not seem to be associated with the active site. Proportional loss of activity occurred as enzyme was titrated with *p*-chloromercuribenzoate for the first 10 SH groups, but loss was greater as the remaining SH groups were titrated. Experiments are in progress to elucidate the role of glutathione in DDT-dehydrochlorinase activity.

72-1466. Bhatia, S. C.; Sharma, S. C.; Venkitasubramanian, T. A. (Dept. of Biochemistry, Vallabhbhia Patel Chest Inst., U. of Delhi, Delhi-7, India). **Acute dieldrin toxicity: biochemical changes in the blood.** *Arch. Environ. Health 24(5): 369-372; 1972.* (31 references)

The effect of a single sublethal dose of dieldrin on values for plasma corticosterone (free), nonesterified fatty acids, blood glucose, glucose tolerance, blood pyruvic acid, blood lactic acid, and liver lactic acid has been investigated. The blood glucose level is elevated and glucose tolerance is lowered, indicating an impairment in the utilization of glucose. A significant increase is observed in the levels of other constituents. A correlation of these effects with adrenocortical activity has been attempted. (Author abstract by permission)

72-1467. Zetterberg, G.; Persson, T. (Inst. of Genetics and Plant Breeding, Agricultural Coll., Uppsala, Sweden). **Effects of paraquat on *Escherichia coli* and yeast.** *Boll. Chim. Farm. 109: 728-732; 1970.* (1 reference)

Results of paraquat treatment of *E. coli* and yeast suggest several modes of action alternative to the reduction of the energy source $NADPH_2$ and decreased formation of hydrogen peroxide. The growth-limiting effect the chemical had on *E. coli* in darkness suggests energy deprivation as a factor. Paraquat + light and also the free radical of paraquat, obtained by reduction with zinc, caused a reduction in growth similar to that noted for paraquat (3.9×10^{-5} M) in darkness. From aerobic and anaerobic experiments with yeast it was determined that oxygen must be present for reduction of growth by paraquat and light.

72-1468. Brodeur, J.; Marchand, C. (Dept. de Pharmacologie, Faculte de Medecine, Universite de Montreal, Montreal, Quebec, Canada). **Effect of splenectomy on the activity of drug-metabolizing enzymes in the liver of rats.** *Can. J. Physiol. Pharmacol. 49(3): 161-166; 1971.* (23 references)

Splenectomy was performed in adult female rats in order to investigate the influence of removal of the spleen on liver microsomal enzymes and cytochrome P-450 *in vitro*, as well as on the pharmacological activity of certain drugs in intact animals. Splenectomy significantly decreases the amount of cytochrome P-450 at one and four days after the operation, but not at seven days. The activity of the enzymes catalyzing the metabolism of parathion, *p*-nitroanisole, and zoxazolamine is also decreased four days after splenectomy, whereas that of the enzymes involved in the metabolism of hexobarbital is unchanged. The maximal induction by phenobarbital of the enzymatic activities catalyzing the metabolism of parathion, *p*-nitroanisole, and zoxazolamine is prevented by splenectomy. Splenectomy exerts very little effect on plasma levels of hexobarbital and hexobarbital sleeping time; however, in both control and phenobarbital-pretreated rats, splenectomy results in a marked increase in the duration of zoxazolamine paralysis. These results indicate that splenectomy exerts inhibitory effects on certain liver microsomal enzymes, and provide some indirect evidence in support of the view that the hepatic blood supply is important for maintaining normal levels of drug-metabolizing enzyme activity in the liver. (Author abstract by permission)

72-1469. Jirik, V.; Pokorny, J.; Culikova, H. (Ustav Hygieny, Prague, Czechoslovakia). **Problematika odbouravani organofosforoveho insekticida fosfotionu v povrchove vode. [Investigation of the degradation of the organophosphate insecticide Fosfotion in surface water.]** *Cesk. Hyg. 16(6): 177-182; 1971.* (5 references) (Czech)

The decomposition of Fosfotion (50% malathion) in surface water with a natural microbial population was investigated; specific microbes involved in this process were sought. Fosfotion was added to the water at a concentration of 10 ppm, and bacterial counts were performed at regular intervals by the culture and direct count methods. Daily carbon dioxide production, organophosphate content by bioassay, dissolved oxygen and odor intensity were also measured. Bacterial colonies cultured from control and Fosfotion-containing solutions were compared by means of standard biochemical tests (protein degradation, carbohydrate utilization) in order to detect preferred growth of any microbial type. The majority of the decomposition had taken place by the tenth day of the experiment. The sharpest decrease in dissolved oxygen content of the water was observed between days 5 and 10, and a marked decrease in odor production was noted on the tenth day. The normal microflora present in the water participated in the decomposition; there was no evidence of any change in microflora due to the presence of Fosfotion.

72-1470. Philpot, R. M.; Hodgson, E. (Dept. of Entomology, North Carolina State U., Raleigh, NC 27607). **The production and modification of cytochrome P-450 difference spectra by *in vivo* administration of methylene dioxyphenyl compounds.** *Chem.-Biol. Interactions 4(3): 185-194; 1972.* (22 references)

The *in vivo* administration of piperonyl butoxide (PB) caused an increase in liver wet weight and total microsomal protein. An initial drop, between 2 and 12 hrs, and then a rise in cytochrome P-450 level, at 36 hrs, was measured by the carbon monoxide difference spectrum. Propyl isome (PI) administration yielded a similar reduction at 12 hrs and an increase at 48 hrs, without altering liver weight or microsomal protein. PB, which seems to have a more specific effect, produced a biphasic shift in the ethyl isocyanide equilibrium point; specific changes occurred in the levels of the cytochrome P-450 difference spectra produced by hexobarbital, a type-I substrate, and pyridine, a type-II substrate. *In vivo* administration of PB yielded a difference spectrum when microsomes were dithionite reduced, which was duplicated *in vitro*. PI and sulfoxide also produced this type-III spectrum.

72-1471. Hrdina, P. D.; Singhal, R. L.; Peters, D. A. V.; Ling, G. M. (Dept. of Pharmacology, Faculty of Medicine, U. of Ottawa, Ottawa, Canada). **Role of brain acetylcholine and dopamine in acute neurotoxic effects of DDT.** *Eur. J. Pharmacol. 15: 379-382; 1971.* (22 references)

Central nervous system symptoms of hyperexcitability and tremor, and hyperpyrexia were observed between two and five hr following oral administration of 600 mg/kg *p,p'*-DDT, but not *o,p'*-DDT, to male and female rats. A steady decrease in acetylcholine levels in the striatum corresponded with the increase in neurotoxic effects, but no change was observed in striatum dopamine levels. The hyperthermia observed could be due to increased muscular activity or an effect on regulating mechanisms. It appears that the neurotoxic effects observed after *p,p'*-DDT administration may be mediated by cholinergic mechanisms in the striatum.

72-1472. Yamaguchi, M.; Chu, C. W.; Yang, S. F. (U. of California, Davis, CA). **The fate of ^{14}C(2-chloroethyl) phosphonic acid in summer squash, cucumber, and tomato.** *J. Amer. Soc. Hort. Sci. 96(5): 606-609; 1971.* (25 references)

The continued translocation and slow degradation observed after application of carbon-labelled (2-chloroethyl)phosphonic acid (ethephon) to leaves and fruits of the 'Tiny Tim' tomato and 'Pioneer' cucumber and to seedlings of the 'Yellow Crookneck' summer squash can explain long term effects on tomato ripening and sex expression of cucurbit. In treated tomato plants total ethylene production increased rapidly at first, and then continuously throughout the experiment, while radioactive ethylene output reached a maximum in two days. Ethephon itself was translocated from either site of application. Up to 18% of the applied amount was found in the fruit. Following treatment of summer squash, total and radioactive ethylene production reached a peak at one day and declined rapidly. Radioactive carbon dioxide production was very low. Translocation of ethephon was observed and, after two days, an unknown metabolite was found at the site of application and at other locations. Radioactive content of fruits in leaf-treated cucumber plants were 0.1% to 0.2% of applied material and the *Rf* values could not be obtained. In fruits that had been treated, growth was almost completely arrested. Translocation to other fruits occurred.

72-1473. Herigstad, R. R.; Whitehair, C. K.; Beyer, N.; Mickelsen, O.; Zabik, M. J. (Dept. of Pathology, Michigan State U., East Lansing, MI 48823). **Chronic methylmercury toxicosis in calves.** *J. Amer. Vet. Med. Ass. 160(2): 173-182; 1972.* (18 references)

Clinical signs, lesions, and tissue residues were determined in five calves after the feeding of graded amounts of a methylmercury (Ceresan L) product over an extended period. Between the 35th and 91st days of the study, three of the calves developed clinical signs of toxicosis characterized by a sudden onset of ataxia and neuromuscular incoordination, which progressed rapidly

to convulsions and a moribund state. Gross morphologic lesions were minimal. The histopathologic changes were principally a reduction in the number of cells in the cerebellar granular layer and toxic nephrosis involving the proximal convoluted tubules. The rates of mercury deposition in blood plasma, erythrocytes, and hair varied throughout the experiment. Mercury residues in tissues at necropsy were not correlated with the cumulative amount fed or the onset of clinical signs but were relatively consistent for each calf when the residues in samples of hair, liver, kidney, brain, and semitendinosus muscle were compared. (Author abstract by permission)

72-1474. Palmer, J. S. (Toxicological Research Lab., Veterinary Sciences Research Div., ARS, U.S. Dept. of Agriculture, Kerrville, TX 78028). **Toxicity of a 4-chloro-2-butynyl-*m*-chlorocarbanilate (barban) formulation to cattle, sheep and chickens.** *J. Amer. Vet. Med. Ass. 160(3): 338-340; 1972.* (3 references)

Clinical trials on the toxicity of a barban formulation to cattle, sheep, and chickens were made. The herbicide was given daily at various dosages for up to ten days. Signs of poisoning were anorexia in all species studied and reduced weight gains in chickens. Principal necropsy findings included congestion and hemorrhage of the digestive tract, liver, and kidneys. Of the dosages used, the minimum toxic dosage was 25 mg/kg body weight for cattle, 10 mg/kg body weight for sheep, and 50 mg/kg body weight for chickens. (Author abstract by permission)

72-1475. Reyes, H.; Levi, A. J.; Gatmaitan, Z.; Arias, I. M. (Div. of Gastroenterology, Dept. of Medicine of the Albert Einstein College of Medicine, New York, NY 10461). **Studies of Y and Z, two hepatic cytoplasmic organic anion-binding proteins: effect of drugs, chemicals, hormones and cholestasis.** *J. Clin. Invest. 50: 2242-2252; 1971.* (31 references)

It has been postulated that two hepatic cytoplasmic proteins designated as Y and Z participate in the transfer of organic anions such as dyes, drugs, hormones, and pesticides from plasma into the liver cell. Continued studies of these proteins revealed that the concentration of Y, the more important of the two, increases in rat liver after administration of phenobarbital. This rise is accompanied by enhanced plasma disappearance rate and hepatic accumulation of sulfobromophthalein (BSP) and indocyanine green (ICG). Similar effects were produced by other substances which are known to cause proliferation of smooth endoplasmatic reticulum and enhancement of drug metabolism, such as dieldrin and DDT. Hormonal changes also affected the level of Y and the resulting dye transfer; only thyroxine restored Y and BSP uptake to normal in hypophysectomized or thyroidectomized rats. Cholestasis produced by ethynyl estradiol administration or chronic bile duct ligation reduced Y, Z, and BSP accumulation. The results suggest that the increase in plasma disappearance of various compounds after pretreatment with "inducers" may be due to increases in the levels of these hepatic cytoplasmic proteins, thus facilitating organic anion uptake, rather than in microsomal enzyme activities.

72-1476. Brown, D. R.; Murphy, S. D. (Dept. of Physiology, Kresge Center for Environmental Health, Harvard School of Public Health, Boston, MA). **Metabolic factors which influence triethyl phosphate-induced narcosis in rats.** *J. Pharmacol. Exp. Ther. 179(2): 396-403; 1971.* (13 references)

Results of an investigation of the blood and brain levels of triethyl phosphate (TEP) and its *in vitro* metabolism in weanling rats, 2 to 6 wk old, suggest that the shorter duration of TEP-induced narcosis is due to higher rates of metabolism during uptake. Since the same TEP levels were found in brain tissue taken from adult and weanling rats at the time of recovery from narcosis induced by 500 mg/kg TEP, brain sensitivity differences were not responsible for the age differences in responses. In weanlings the rate of disappearance of TEP from the brain, particularly in the second phase, was greater than in adults, and the *in vitro* rate of metabolism of TEP was greater by weanling liver slices than by newborn or adult liver slices. Indirect evidence that TEP is metabolized by microsomal enzymes was indicated by experiments on the *in vitro* rate of metabolism in the presence of SKF 525A, an inhibitor of microsomal enzymes, and phenobarbital, an inducer of microsomal enzymes, and on *in vivo* disappearance of TEP from plasma and brain following pretreatment with these compounds. A higher rate of metabolism in weanlings during uptake probably results in a smaller brain TEP excess over the narcosis threshold concentration.

72-1477. Grifantini, M.; Martelli, S.; Stein, M. L. (Inst. of Pharmaceutical and Organic Chemistry, U. of Camerino, Italy). **Structure-activity relationships in reactivators of organophosphorus-inhibited acetylcholinesterase V: quaternary salts of hydroxyiminomethylimidazoles.** *J. Pharm. Sci. 61(4): 631-633; 1972.* (15 references)

Several quaternary salts derived from hydroxyiminomethylimidazoles were synthesized and tested *in vitro* as reactivators of acetylcholinesterase inhibited by tetraethylpyrophosphate (TEPP) and diisopropylphosphonofluoridate (DFP). The methiodides of (*E*)-1-methyl-2-hydroxyiminomethylimidazole and (*E*)-1-benzyl-2-hydroxyiminomethylimidazole were 1/4 and 1/2 as active, respectively, as 2-hydroxyiminomethyl-1-methylpyridinium iodide. The (*Z*)-1-methyl-5-hydroxyiminomethylimidazole methiodide was inactive, probably because the nucleophilic oximate group in the reactivator-phosphorylated enzyme complex was not oriented satisfactorily. Unlike the pyridine oximes, the imidazole oximes have approximately the same activity in the presence of different organophosphates.

72-1478. Bollag, J. M.; Liu, S. Y. (Lab. of Soil Microbiology, Dept. of Agronomy, Pennsylvania State U., University Park, PA 16802). **Hydroxylations of carbaryl by soil fungi.** *Nature (London) 236(5343): 177-178; 1972.* (7 references)

Thin-layer chromatography and identification of radiolabeled spots were used to investigate the metabolism of carbaryl by a number of soil fungi. The uninoculated control medium was found to contain 1-naphthol after five days, indicating chemical decomposition. Most of the culture filtrates contained hydroxylated derivatives. 1-Naphthyl *N*-hydroxymethylcarbamate was the major metabolic product found, although *Pencillium* sp., *Mucor* sp. and *Rhizopus* sp. tended to hydroxylate in the ring position. In all the cultures, a decrease of radioactivity from carbaryl corresponded with the amount of metabolites formed.

72-1479. Gross, W. B.; Colmano, G. (Virginia Polytechnic Inst. and State U., Veterinary Science Dept., Blacksburg, VA 24061). **Effect of infectious agents on chickens selected for plasma corticosterone response to social stress.** *Poultry Sci. 50: 1213-1217; 1971.* (5 references)

Chickens selected for low plasma corticosterone response to social stress exhibited more resistance to Marek's disease and *Mycoplasma gallisepticum* infection and less resistance to *E. coli* infection, and produced more *E. coli* antibody than those selected for high corticosterone levels. They also responded more readily to treatment with the adrenal blocking agent DDD (TDE). Birds which were inoculated with *Mycoplasma gallisepticum* on the second day of treatment were given DDD at doses of 250 to 1000 mg/kg of food for 14 days. In both a high and low stress environment, the lesions were less severe in the treated, low corticosterone chickens.

72-1480. Krampl, V. (Vyskumny Ustav Hygieny Prace a Chorob z Povolania, Bratislava, Czechoslovakia). **Dynamika zmien enzymovej aktivity pri hodnoteni toxicity pesticidov na baze chlorovanych cyklodienovych zlucenin. [Dynamics of changes in enzyme activity in evaluating the toxicity of pesticides based on chlorinated cyclodiene compounds.]** *Prac. Lek. 24(1): 3-7; 1972.* (18 references) (Czech)

Changes in the activities of glutamic-pyruvic transaminase (SGPT) and aldolase (ALD) in the serum of female white rats (groups of six each) were investigated, following the administration of a single peroral dose of 40 mg/kg aldrin or dieldrin in oil. The changes in these activities were also examined during repeated oral administration of 7 or 12 mg/kg/day of these substances for four weeks. The SGPT and ALD activities were significantly enhanced after single or repeated doses of aldrin and dieldrin. The changes in enzyme activity were most pronounced 72 hr after the single dose, and on the seventh day of the short-term experiment. These findings indicate that the elevation of SGPT and ALD activity might represent a suitable criterion for evaluating the acute and subacute toxicity of chlorinated cyclodiene insecticides.

72-1481. Falk, H. L. (National Inst. of Environmental Health Sciences, Research Triangle Park, NC). **Anticarcinogenesis—an alternative.** *Progr. Exp. Tumor. Res. 14: 105-137; 1971.* (107 references)

The ubiquitousness of carcinogenic compounds of both natural and man-made origins suggests the possibility of employing some type of prophylactic measure against cancer. The anticarcinogenic effects of some chemicals and other factors are reviewed. Hormonal means of anticarcinogenesis were among the earliest discovered; the anticarcinogenic effect of *o,p'*-DDD (TDE) falls in this category, and has actually been used in the treatment of specific neoplastic conditions. The anticarcinogenic effect of enzyme induction has been widely discussed. Among the substances reportedly employed as inducers are DDT, dieldrin, aldrin, heptachlor, and chlordane. Chlorinated hydrocarbon insecticides rapidly enhance steroid metabolism, and increase RNA and protein in the smooth endoplasmatic reticulum. After cessation of exposure, the numerous enzyme systems induced decline to normal levels at various rates. Apparently, by favoring certain metabolic pathways, the increased enzyme levels reduce the amounts of substrates available for conversion to carcinogenic metabolites. Although hepatic microsomal enzymes are primarily involved, increased enzyme activity has also been observed in other systems, e.g., mitochondrial oxidative enzyme systems, following treatment with inducers.

72-1482. Rowe-Rowe, D. T. (Natal Parks Board, Pietermaritzburg, Natal, S. Africa). **Rotenone tolerances of some freshwater fishes of Natal.** *Progr. Fish-Cult. 33(4): 206-209; 1971.* (5 references)

The effect of various concentrations of rotenone on nine freshwater fishes of Natal were studied at 22° using Derris powder which contained 6.5% of the chemical. The LC50's ranged from 0.0016 to 0.0120 ppm rotenone in eight of the species. In *Barbus gurneyi*, the ninth species, 0.0516 ppm rotenone was required to kill 50% of the fish. In a study of the effect of size within the species *Tilapia sparrmanii*, the LC50 was larger for larger fish. The effect of rotenone on mouthbreeder eggs and immature stages was observed. Concentrations strong enough to kill 50% of adult *Pseudocrenilabrus philander* also killed fry within 24 hr and eggs within 48 hr. Alevins lived for 5 to 10 days, but could not swim in an upright position and remained at the bottom of the aquarium until death occurred.

72-1483. Mosser, J. L.; Fisher, N. S.; Wurster, C. F. (Marine Sciences Research Center, State U. of New York, Stony Brook, NY 11790). **Polychlorinated biphenyls and DDT alter species composition in mixed cultures of algae.** *Science 176(4034): 533-535; 1972.* (14 references)

Either DDT or polychlorinated biphenyls were added to mixed cultures containing a marine diatom and a marine green alga that were sensitive and resistant, respectively, to these organochlorine compounds. The diatom grew faster and was therefore dominant in control cultures, but its dominance diminished in treated cultures, even at concentrations of chlorinated hydrocarbons that had no apparent effect in pure cultures. Such stable pollutants could disrupt the species composition of phytoplankton communities, thereby affecting whole ecosystems. (Author abstract by permission. Copyright 1972 by the American Association for The Advancement of Science)

72-1484. Ludke, J. L.; Gibson, J. R.; Lusk, C. I. (Dept. of Zoology, Mississippi State U., State College, MS 39762). **Mixed function oxidase activity in freshwater fishes: aldrin epoxidation and parathion activation.** *Toxicol. Appl. Pharmacol. 21(1): 89-97; 1972.* (17 references)

Experiments are described which demonstrate that freshwater fishes possess mixed function oxidase (MFO) enzymes which catalyze the epoxidation of aldrin and the activation of parathion *in vivo*. These reactions apparently occur in the liver as evidenced by rapid aldrin accumulation in the liver followed by simultaneous aldrin decrease and dieldrin increase. MFO inhibitors, sesamex and SKF 525A, antagonized both parathion activation and toxicity, but antagonized only the epoxidation of aldrin. A mutual antagonism between parathion and aldrin is shown in which simultaneous treatment reduces the metabolism of both compounds. The action of sesamex is clearly in liver as evidenced by inhibition of *in vitro* activation of parathion. These results suggest thet MFO systems in freshwater fishes may be a rule rather than an exception and that previous failures to demonstrate *in vitro* epoxidation of aldrin may be the result of inadequate methodology. Findings also substantiate observations that aldrin epoxidation is not necessarily an activation. (Author abstract by permission)

72-1485. Lynch, W. T.; Coon, J. M. (Lederle Labs. Pearl River, NY 10965). **Effect of tri-*o*-tolyl phosphate pretreatment on the toxicity and metabolism of parathion and paraoxon in mice.** *Toxicol. Appl. Pharmacol. 21(2): 153-165; 1972.* (16 references)

Mice receiving po 400 mg/kg of tri-*o*-tolyl phosphate (TOTP) showed, 24 hr later, decreased mortality following parathion, Co-Ral (coumaphos), EPN, and DFP given po; increased mortality following TEPP, eserine and Guthion (azinphosmethyl) po; and no change in mortality following paraoxon po. TOTP administered ip also protected mice against parathion given po. TOTP pretreatment po increased mortality following ip and sc administration of parathion and paraoxon. Rate constants were obtained representing the change in brain cholinesterase activity with time following po or ip administration of parathion and paraoxon to control and TOTP-pretreated mice. The alteration of rate constants by TOTP pretreatment reflected the alteration of toxicity. Other effects of TOTP pretreatment included: (a) decrease in plasma but no change in liver A-esterase activity, (b) apparent decrease in tissue binding of paraoxon, (c) slight increase in the rate of conversion of parathion to paraoxon in liver microsomes and intestinal strips, and (d) decrease in hexobarbital but no change in barbital sleeping time. Liver microsomal nitrogen and liver weight were unaltered. It is suggested that TOTP pretreatment either increases the activity of liver detoxifying enzymes other than A-esterase or decreases the rate of absorption of parathion and paraoxon from the gut, or both. (Author abstract by permission)

72-1486. Mathur, D. S. (Zoological Survey of India, Desert Regional Station, Jodhpur, Rajasthan, India). **Histopathological changes in the intestine, kidney and ovaries of certain fishes induced by benzene hexachloride and dieldrin.** *Toxicon 8(2): 141-142; 1970.* (3 references)

Pathological alterations produced in the kidneys of fish (*Channa punctata, Heteropneustes fossilis* and *Puntius sophore*) by benzene hexachloride (BHC) included moderate degeneration and vacuolation in the tubular epithelium and loss of parenchymatous cells of the renal tubules. The intestine appeared nearly normal except for vacuolation and slight epithelial degeneration at some points. Some ova showed mild atrophic changes, and the cytoplasm of ova and oocytes showed degeneration and cracking. *Channa punctata* was most sensitive in all cases. After exposure to dieldrin (dosage and administration route not specified for dieldrin or BHC), the kidney remained unaffected, whereas the intestine displayed atrophy and vacuolation.

72-1487. Whiting, F. M.; Stull, J. W.; Brown, W. H. (Dept. of Dairy and Food Sciences, U. of Arizona, Tucson, AZ). **Pesticide depletion in dairy cows following long term exposure.** *Bull. Environ. Contam. Toxicol. 7(2/3): 75-79; 1972.* (14 references)

A group of Holstein cows, nine lactating and six in advanced stages of gestation, was transferred from an environment of moderately high organochlorine pesticide contamination to one of very low intake (less than 0.01 ppm in feed). In the initial sample the total DDT (DDT + DDT derived compounds) concentration in the lactating cow's milk fat averaged 1.79 ppm with a range of 0.93 to 3.30 ppm. After eight or ten months on low-

residue feed, the pesticide concentration in the milk fat averaged 0.19 ppm. The rate of decline was relatively uniform, and the half-time averaged two months. Cows beginning lactation after transfer to the low-pesticide diet showed a slower drop in their milk fat organochlorine concentration, with a half-time of about four months. The longer half-time might be related to the dilution of body pesticide stores accompanying weight gain and fetal development. Idiosyncratic variations were apparent in comparing the initial and final organochlorine pesticide levels in milk fat of cows on identical diets.

72-1488. Koch, R. B.; Desaiah, D.; Yap, H. H.; Cutkomp, L. K. (Dept. of Entomology, Fisheries and Wildlife, U. of Minnesota, St. Paul, MN). **Polychlorinated biphenyls: effect of long-term exposure on ATPase activity in fish, *Pimephales promelas*.** *Bull. Environ. Contam. Toxicol. 7(2/3): 87-92; 1972.* (14 references)

Newly hatched fathead minnows (*Pimephales promelas*) were reared in aquaria containing 0, 0.93, 2.8 or 8.3 ppb of Aroclor 1242 or Aroclor 1254 (PCBs) for 4 months. The median lethal time at the maximum concentration was about 5 month. Na^+-K^+- as well as Mg^{2+}-activated ATPase activities (both sensitive and insensitive to oligomycin in the latter case) were determined in fish kidney, brain and liver. Interpretation of these results is somewhat difficult as enzyme activities were more markedly inhibited at the intermediate PCB level than at the higher or lower levels. Therefore, a dose-effect relationship could not be established. It is apparent though that a difference exists in the response of ATPase activities to Aroclors 1254 and 1242 for *in vitro* and *in vivo* exposure. Both Aroclor 1242 and Aroclor 1254 caused stimulation of ATPase activity in some instances; when stimulation occurred, it was generally more prominent at lower concentrations, and rather erratic. Kidney tissue ATPases appeared to respond most sensitively to PCB exposure, whereas brain showed only inhibition of oligomycin-sensitive Mg^{2+} ATPase after exposure to both Aroclors.

72-1489. Cranmer, M. F. (Perrine Primate Lab., Environmental Protection Agency, P.O. Box 490, Perrine, FL 33157). **Absence of conversion of *o,p'*-DDT to *p,p'*-DDT in the rat.** *Bull. Environ. Contam. Toxicol. 7(2/3): 121-129; 1972.* (8 references)

^{14}C ring-labeled *o,p'*-DDT was employed in this study to verify the reports of other authors indicating that *o,p'*-DDT is converted to *p,p'*-DDT in the rat. Female rats were fed diets containing 50 ppm *o,p'*-DDT for 12 weeks, then 1 mg of *o,p'*-DDT-^{14}C per day for 3 days before sacrifice. Fat samples were analyzed for pesticide content by gas-liquid chromatography, and the results confirmed by thin-layer chromatography. The radioactivity present in each of the separated residues was determined by liquid scintillation counting of the components, trapped in cool capillary tubes at the gas chromatograph exit. No ^{14}C activity was detected in the *p,p'*-DDT or *p,p'*-DDE, but such activity was present in the *o,p'*-DDT and *o,p'*-DDD (TDE); the specific activities for the latter two compounds were nearly equal. These findings indicate that *o,p'*-DDT is not converted to *p,p'*-DDT in the rat.

72-1490. Chadwick, R. W.; Freal, J. J. (Perrine Primate Lab., Environmental Protection Agency, P.O. Box 490, Perrine, FL 33157). **The identification of five unreported lindane metabolites recovered from rat urine.** *Bull. Environ. Contam. Toxicol. 7(2/3): 137-146; 1972.* (28 references)

Gas-chromatographic analysis of urine from rats fed a diet containing 400 ppm lindane revealed the presence of at least five previously unknown metabolites, in addition to the 2,3,5- and 2,4,5-trichlorophenols previously reported. Metabolites were separated from urine by solvent partitioning and column fractionation, followed by collection of gas-chromatographic effluents. The substances obtained were compared with standard substances by mass spectrometry and gas chromatography of the free phenols as well as their ethyl ether derivatives. In this way, four of the metabolites were identified as 3,4-dichlorophenol; 2,4,6-trichlorophenol; and 2,3,4,5- and 2,3,4,6-tetrachlorophenol. The fifth metabolite required, in addition, the use of infrared, NMR and ultraviolet spectrometry, and was determined to be 2,3,4,5,6-pentachloro-2-cyclohexene-1-ol. To account for formation of this substance, a degradation process more complex than that now assumed for lindane in the rat will have to be devised.

72-1491. Wildish, D. J. (Fisheries Research Board of Canada, Biological Station, St. Andrews, New Brunswick, Canada). **Polychlorinated biphenyls (PCB) in sea water and their effect on reproduction of *Gammarus oceanicus*.** *Bull. Environ. Contam. Toxicol. 7(2/3): 182-187; 1972.* (8 references)

Gammarus oceanicus pairs or groups were held under laboratory rearing conditions in sea water containing 0, 1, 10, or 100 mg/l. of Aroclor 1254 (PCBs) solubilized with Corexit 7664. A regression equation for the survival of the animals was obtained by plotting the logarithm of the median lethal time against the logarithm of the initial concentration X the exposure time (C't). The equation suggested that Aroclor 1254 is a cumulative poison, and gave LT50 = 41.6 days for C't = 1 mg/l. hr. Mating success decreased from 100% for C't = 0 or 1 to 85% for C't = 10, 45% for C't = 100, and 40% for C't = 1000. The decrease in matings completed seemed to be due to toxic effects in the males. Assuming that the time in precopula is 20 days, the minimum concentration which would produce mating failure is 0.021 mg/l. of Aroclor solubilized in Corexit 7664 in sea water. Survival and development were hindered in the

embryos from parents exposed to 10 and 100 mg/l. of PCBs for 10 hr.

72-1492. Thill, R. E.; Severson, K. E.; Greichus, Y. A. (Dept. of Wildlife and Fisheries Sciences, South Dakota State U., Brookings, SD). **Effects of aldrin on young pheasants under semi-natural conditions.** *Bull. Environ. Contam. Toxicol. 7(2/3): 188-192; 1972.* (10 references)

Pesticide exposure under natural conditions was simulated by confining pheasant chicks with broody hens on one-acre test plots, the center two-thirds of which were planted to corn and treated with aldrin at 2 lb/A. The aldrin, applied in the form of an emulsifiable concentrate, was immediately disced into the soil. The broods were released onto the plots about one month after treatment. The mortality rates were relatively high and approximately equal on treated and control plots, presumably due to losses during a hailstorm, cool wet weather, and lack of food. Residue levels in dead birds did not differ from those in survivors. Aldrin + dieldrin levels in birds on treated plots averaged 0.38 ppm (based on whole body, wet weight) and 0.08 ppm in birds on control plots, and apparently did not vary over time between 19 and 92 days.

72-1493. Friend, M.; Trainer, D. O. (Dept. of Veterinary Science, U. of Wisconsin, Madison, WI 53706). **Duck hepatitis virus interactions with DDT and dieldrin in adult mallards.** *Bull. Environ. Contam. Toxicol. 7(4): 202-206; 1972.* (15 references)

Adult mallard ducks (*Anas platyrhynchos*) were inoculated with duck hepatitis virus (DHV) at $10^{6.5}$ times the duckling median lethal dose. Forty-eight hours later, the ducks were placed on a diet containing 500 or 900 ppm of DDT, 40 or 80 ppm of dieldrin, or neither, and continued on this regimen for 10 days. Birds were observed and mortality recorded three times a day for 22 days. Mortality in all but one of the groups receiving DHV + pesticides was lower than in the corresponding group receiving pesticide alone, although the differences were not statistically significant. Of the ducks given 900 ppm DDT, 18/60 in the virus-free group died, compared with 0/20 in the group given DHV beforehand; in the group receiving 80 ppm dieldrin, 10/60 of those receiving pesticide alone died, compared to 2/20 of those given DHV as well. Mortality began later and ended sooner in the DHV-treated groups. Despite the lack of statistical confirmation, it appears that DHV may exert some protective effect when administered prior to pesticide exposure, possibly via enhancement of hepatic microsomal oxidative enzyme activity.

72-1494. Hood, R. D. (Dept. of Biology, U. of Alabama, University, AL). **Effects of sodium arsenite on fetal development.** *Bull. Environ. Contam. Toxicol. 7(4): 216-222; 1972.* (12 references)

Single intraperitoneal injections of sodium arsenite at 10 or 12 mg/kg body weight were given to pregnant mice on days 7 to 12 of gestation. A significant increase in fetal mortality and depression of fetal growth was produced. Most fetal deaths occurred shortly after treatment. Gross malformations were observed in about one-fourth of the fetuses treated on days 8 to 10 of development. The most common defects were exencephaly, micrognathia and open eye. Several fetuses also displayed bent, shortened or missing tails. Following application of a standard visualization procedure, skeletal anomalies were also observed in a high percentage of fetuses treated with arsenite on days 8 to 10 of development. The major skeletal defects were fusion of the ribs and fused or missing vertebral ossification centers. Rib defects were observed in fetuses treated on days 8 to 10, and vertebral anomalies in fetuses treated on day 9 or 10. The effects were similar to those observed in arsenate-treated mice, but the dosage required was lower. The findings may indicate interconversion of arsenate and arsenite.

72-1495. Cserjesi, A. J.; Johnson, E. I. (Dept. of the Environment, Canadian Forestry Service, Western Forest Products Lab., Vancouver, British Columbia, Canada). **Methylation of pentachlorophenol by *Trichoderma virgatum*.** *Can. J. Microbiol. 18(1): 45-50; 1972.* (12 references)

The formation of pentachloroanisole by methylation from pentachlorophenol by *Trichoderma virgatum* in liquid cultures was detected using gas chromatography and confirmed by melting point determination and infrared spectroscopy. The formation of pentachloroanisole, however, did not account for the total loss of pentachlorophenol in the medium, suggesting that this reaction is only the first step in the metabolism of this compound or a parallel reaction to degradation. Pentachloroanisole was much less toxic than pentachlorophenol to *Trichoderma virgatum, Cephaloascus fragrans,* and *Penicillium* sp., as well as to fish in laboratory toxicity tests. (Author abstract by permission.)

72-1496. Kelly, W. A. (Purdue U., Lafayette, IN). **Investigations of the responses of rats to diets containing multipesticide components when copper and manganese were fed at deficient, marginal and excess concentrations.** *Diss. Abstr. Int. 32(2): 1045B-1046B; 1971.*

Groups of rats were fed one of fourteen diets, determined by the following parameters: copper or manganese deficient, marginal, normal or excessive; and pesticide mixture added or not added. They were then evaluated in terms of growth, reproduction, skeletal structure and pathological alterations including neoplasia. The pesticide mixture consisted of DDT at 2.3 ppm in the diet, parathion at 0.33 ppm, and carbaryl at 2.4 ppm. Impaired reproductive function was noted in

animals on excess manganese-containing diets, and this tendency was enhanced by the addition of the pesticide mixture. The presence of the pesticide mixture appeared to reduce longevity in offspring of groups fed the copper deficient, copper excess and manganese excess diets. However, the offspring fed the manganese deficient + pesticide diet had an average lifespan of 86.7 weeks as compared with 77.2 weeks for the control group and 54.3 weeks for the control + pesticide group. DDT residues were found in the tissues of the animals receiving the diets containing the pesticide mixtures and the tissue distribution was approximately the same regardless of mineral content. No toxic effects of the pesticides were histologically observable. Neoplasia was less frequent in the groups receiving the pesticides. (Author abstract, by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 71-20,481)

72-1497. Jones, D. W. (Virginia Polytechnic Inst. and State U., Blacksburg, VA). **Absorption, translocation and fate of the herbicide, 2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione, in cotton.** *Diss. Abstr. Int. 32(10): 5564B; 1972.*

Absorption, translocation, and metabolism of the ^{14}C-labeled herbicide 2-(3,4-dichlorophenyl)-4-methyl-1,2,4-oxadiazolidine-3,5-dione (VCS-438) in cotton (*Gossypium hirsutum* L. 'Acala 4-42-77') were studied using autoradiography, thin-layer chromatography, and counting. Foliar penetration and acropetal distribution of ^{14}C occurred within three hr and increased with time. VCS-438-^{14}C was readily metabolized by cotton tissue to 1-(3,4-dichlorophenyl)-3-methylurea (DCPMU) and 1-(3,4-dichlorophenyl)urea (DCPU). Leaf discs metabolized VCS-438-^{14}C rapidly; 12 hr after treatment, 65% of the ^{14}C in methanol extracts was in forms other than intact herbicide. Excised leaves treated through the petiole with either heterocyclic ring-labeled or phenyl ring-labeled herbicide contained little VCS-438-^{14}C after one day; DCPMU was formed early then decreased with time. DCPU accounted for 55 to 70% of the ^{14}C in excised leaves three days after treatment. In intact plants treated via the roots, the herbicide was rapidly metabolized in the roots to DCPMU and DCPU; little or no intact herbicide was translocated to the leaves. Little radioactivity accumulated in the roots with time; the radioactivity in the leaves accounted for 80 to 90% of the methanol-soluble ^{14}C 47 days after treatment. Most of the ^{14}C in the leaves was recovered as DCPU (50 to 60%) and unidentified polar metabolite(s) which remained at the origin of the thin-layer plates (30 to 40%). (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-12,507)

72-1498. Springfield, A. C. (U. of Rhode Island, Kingston, RI). **Liver enlargement and the modification of hepatic microsomal drug metabolism by pyrethrum.** *Diss. Abst. Int. 32(10): 5960B-5961B; 1972.*

Oral administration of pyrethrum to rats at 200 mg/kg for 13 or 23 days resulted in decreases in hepatic DNA concentrations. While total lipid concentrations were increased significantly, this did not account for the observed hepatic enlargement. Protein concentrations of whole liver homogenates, 9000 X *g* supernatants and the 105,000 X *g* pellet were not different from controls. No significant changes occurred in hepatic water concentrations. Accompanying histological observations of the enlarged livers indicated cellular hypertrophy. Significant decreases in hexobarbital induced hypnosis, without concomitant changes in barbital induced hypnosis, suggested that pyrethrum caused an alteration in hepatic drug metabolism. The activities of hepatic microsomal enzymes responsible for EPN detoxification, *p*-nitroanisole demethylation and hexobarbital oxidation were increased to 150, 173 and, 241% of control, respectively. No significant increases were noted in the demethylation of aminopyrine or oxidation of L-tryptophan. NADPH-cytochrome c reductase and p-450 concentrations were also increased. Increases in liver weight, the detoxification of EPN and demethylation of *p*-nitroanisole were dose related. (Author abstract, by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 72-13,292)

72-1499. Yu, C.-C.; Kearns, C. W.; Metcalf, R. L. (Dept. of Entomology, U. of Illinois, Urbana, IL 61801). **Acetylcholinesterase inhibition by substituted phenyl *N*-alkyl carbamates.** *J. Agr. Food Chem. 20(3): 537-540; 1972.* (12 references)

Acetylcholinesterase (AChE, EC 3.1.1.7) inhibition constants (binding, carbamylation, reactivation, and overall bimolecular rate constants) were studied for selected substituted phenyl *N*-alkyl carbamates. *N*-Methyl carbamates were better inhibitors than larger *N*-alkyl carbamates. AChE from different species of animals showed remarkable species specificity toward these inhibitors. *N*-Ethyl carbamates were the least potent inhibitors toward bovine erythrocyte AChE, while *N*-*n*-butyl or *N*-*n*-hexyl carbamates were the least potent inhibitors toward AChE from housefly (*Musca domestica* L.), honeybee (*Apis mellifera* L.), and house cricket (*Acheta domestica* L.). Thus, short chain *N*-alkyl (*N*-methyl to *N*-*n*-propyl) carbamates favored the inhibition of insect AChE, while longer *N*-alkyl (*N*-*n*-butyl and up) carbamates favored the inhibition of bovine erythrocyte AChE. AChE inhibited by short-chain *N*-alkyl carbamates recovered its activity faster than the long-chain *N*-alkyl carbamates. Bovine erythrocyte AChE inhibited by carbamates recovered its activity much faster than insect AChE, especially when the inhibition is made by long-chain *N*-alkyl carbamates. Insecticidal activity was decreased when *N*-alkyl chain length was increased. (Author abstract reprinted by permission of the American Chemical Society)

72-1500. Sell, J. L.; Davison, K. L.; Poonacha, K. B. (Animal Science Dept., North Dakota State U., Fargo, ND 58102). **Decreased aniline hydroxylase activity in Japanese quail due to dietary DDT.** *J. Agr. Food Chem. 20(3): 553-557; 1972.* (29 references)

Activities of hepatic microsomal aniline hydroxylase (AH) and *N*-demethylase (ND) were determined in Japanese quail fed 200 ppm of DDT. AH activity in livers from newly hatched quail produced by strains fed DDT was significantly less than that of a control strain. However, AH activity of progeny from strains previously fed DDT was the same as that of the controls after a diet containing no DDT was fed for 22 days after hatch. Hepatic AH and ND activities were depressed markedly when quail were fed 200 ppm of DDT. In contrast, Cytochrome P_{450} concentration in the microsomes was increased significantly by DDT. The magnitude of the response to dietary DDT was the same in quail of the control strain and those selected for low mortality. DDT and DDE were found to inhibit AH activity when added to an *in vitro* medium at 10^{-7} *M* or more. The depressing effect of both DDT and DDE on AH activity appeared to be by way of competitive inhibition. (Author abstract reprinted by permission of the American Chemical Society)

72-1501. Moffett, G. B.; Yarbrough, J. D. (Dept. of Zoology, Mississippi State U., State College, MS 39762). **The effects of DDT, toxaphene, and dieldrin on succinic dehydrogenase activity in insecticide-resistant and susceptible *Gambusia affinis*.** *J. Agr. Food Chem. 20(3): 558-560; 1972.* (18 references)

Succinic dehydrogenase activity in mitochondria of insecticide-resistant and susceptible mosquitofish (*Gambusia affinis*) was assayed manometrically by the phenazine methosulfate method. Intact and disrupted mitochondria from livers and brains were used. The enzymatic activity in intact mitochondria from resistant fish was either stimulated or not affected by dieldrin or DDT. Toxaphene inhibited intact mitochondrial preparations from resistant brain tissue. Succinic dehydrogenase activity in intact susceptible mitochondria was inhibited by all three insecticides. In mitochondria with disrupted membranes, enzymatic activity was inhibited by the insecticides in both resistant and susceptible fish. Inhibition of succinic dehydrogenase activity by the insecticides only after disruption of the resistant mitochondrial membrane indicates that a membrane barrier exists in insecticide-resistant mosquitofish. (Author abstract reprinted by permission of the American Chemical Society)

72-1502. Bordeleau, L. M.; Rosen, J. D.; Bartha, R. (Dept. of Biochemistry and Microbiology, Rutgers, U., New Brunswick, NJ 08903). **Herbicide-derived chloroazobenzene residues: Pathway of formation.** *J. Agr. Food Chem. 20(3): 573-578; 1972.* (44 references)

In soil, the chloroaniline moieties of certain phenylamide herbicides are liberated by microbial acylamidases, and are subsequently transformed by peroxidases to stable chloroazobenzene residues. The intermediate steps of this transformation were studied by allowing 4-chloroaniline or 3,4-dichloroaniline to react under steady state conditions with peroxidase and H_2O_2. The results indicated that the initial attack of peroxidase produced a free chloroanilino radical. Formation of another labile intermediate, chlorophenylhydroxylamine, was detected by the spectrum of its trisodium pentacyanoaminoferroate complex. The obtained results are consistent with a proposed pathway involving the transformation of the chloroanilines by peroxidases to chlorophenylhydroxylamines, with or without involvement of free chloroanilino radicals. The chlorophenylhydroxylamines spontaneously condense with excess chloroanilines and form chloroazobenzenes. The last step may be indirect and may involve the rapid autoxidation of the respective chlorohydrazobenzene intermediates. (Author abstract reprinted by permission of the American Chemical Society)

72-1503. Sauer, H. H. (Agrochemical Research Div., SANDOZ A.G., Basel, Switzerland). **Fate of formothion on bean plants in the greenhouse.** *J. Agr. Food Chem. 20(3): 578-583; 1972.* (27 references)

The fate of formothion was studied on bean plants following foliar application. In general, the distribution pattern between the vapor phase, surface, and subsurface area was similar to that of dimethoate. The half-life of formothion breakdown amounted to 1.2 days. Hydrolytic attack caused rapid formothion degradation to approximately equal amounts of dimethoate and *O,O*-dimethyl dithiophosphorylacetic acid. Further breakdown products were dimethoxon, *O,O*-dimethyldithiophosphoric acid, and bis(*O,O*-dimethylthiophosphoryl) disulfide. Only dimethoate and dimethoxon were insecticidally active metabolites. Although their residual amounts were considerably lower after application of Anthio than of dimethoate, and although formothion itself dissipated very fast, the insecticidal efficacy of Anthio was equal to dimethoate. It is concluded that the initial biological action after formothion treatment is caused by formothion itself. The long-term efficacy, however, is generated by potentiation of the insecticidal activity of the Anthio metabolites dimethoate and possibly dimethoxon by synergistic action of *O,O*-dimethyldithiophosphorylacetic acid and bis-(*O,O*-dimethylthiophosphoryl)disulfide. (Author abstract reprinted by permission of the American Chemical Society)

72-1504. Sethunathan, N.; Pathak, M. D. (The International Rice Research Inst., Los Banos, Laguna, The Philippines). **Increased biological hydrolysis of diazinon after repeated application in rice paddies.** *J. Agr. Food Chem. 20(3): 586-589; 1972.* (11 references)

Repeated application of diazinon granules to the soil surface of rice fields affected the development of a biological factor that caused rapid degradation of diazinon. This factor was present in the paddy water, in rhizosphere soil of the rice plant, and in nonrhizosphere soils. Isotope studies showed that when incubated with water from diazinon-treated fields, diazinon was hydrolyzed to 2-isopropyl-6-methyl-4-hydroxypyrimidine in about 75 hr after incubation. Within the next 25 hr, this hydrolysis product was completely mineralized, apparently to CO_2. No other metabolite was recorded on the autoradiochromatogram. This rapid hydrolysis of diazinon in paddy water from diazinon-treated fields was of a microbial nature. This microbial factor developed only in diazinon-treated fields and degraded diazinon, but not other insecticides related to it. The addition of streptomycin to the incubation mixture prevented the breakdown of diazinon. (Author abstract reprinted by permission of the American Chemical Society)

72-1505. McKinney, J. D.; Matthews, H. B.; Fishbein, L. (National Inst. of Environ. Health Sciences, NIH, Public Health Service and Dept. of Health, Education, and Welfare, Research Triangle Park, NC 27709). **Major fecal metabolite of dieldrin in rat. Structure and chemistry.** *J. Agr. Food Chem. 20(3): 597-602; 1972.* (35 references)

The structure (C-12 *syn*-hydroxydieldrin) of the major fecal metabolite of dieldrin in the rat has been confirmed *via* pmr spectroscopy employing spin decoupling techniques and the new shift reagent, $Eu(DPM)_3$. Detailed studies of the spectral and reaction properties of this metabolite have established the stereochemical structure and have shown that the system is susceptible to degradation. Evidence is presented which indicates that the major fecal metabolite in the rat cannot be converted to the major urinary metabolite but that a common intermediate hybrid ion (or radical) may exist in their formation from dieldrin. It is proposed that an activated dieldrin molecule may mimic certain male steroidal hormones or their precursors in regard to the capability of anchimeric participation of a double bond. (Author abstract reprinted by permission of the American Chemical Society)

72-1506. Bakke, J. E.; Larson, J. D.; Price, C. E. (U.S. Dept. of Agriculture, Animal Science Research Div., ARS, Metabolism and Radiation Research Lab., Fargo, ND 58102). **Metabolism of atrazine and 2-hydroxyatrazine by the rat.** *J. Agr. Food Chem. 20(3): 602-607; 1972.* (10 references)

Rats were given either ^{14}C-ring-labeled atrazine (I) or 2-hydroxyatrazine (II) as a single oral dose. Seventy-two hours after dosing the radioactivity was recovered, mainly in the urine (I, 65.5%; II, 78%) and feces (I, 20.3%; II, 5.5%). Less than 0.1% of the dose from either compound was detected in the expired air, and less than 0.1% of the ^{14}C from II was detected in the body tissues. The carcasses of the rats given I contained 15.8% of the dose, and the distribution of this radioactivity in selected tissues was determined. II and its two mono-*N*-dealkylated analogs (VI and VII) were identified in the urine from rats given II. These represented 88.4% of the urinary radioactivity. Nineteen urinary metabolites from I were separated by ion-exchange chromatography. Four of these (approximately 47% of the urinary radioactivity) were identified as II, VI, VII, and ammeline. Two additional metabolites of I, representing approximately 10% of the urinary radioactivity, were characterized by mass spectrometry. (Author abstract reprinted by permission of the American Chemical Society)

72-1507. Andrawes, N. R.; Chancey, E. L.; Crabtree, R. J.; Herrett, R. A.; Weiden, M. H. J. (Research and Deveolpment Dept., Chemicals and Plastics, Union Carbide Corp., Clayton, NC 27520). **Fate of naphthyl-*1*-^{14}C carbaryl in laying chickens.** *J. Agr. Food Chem. 20(3): 608-617; 1972.* (20 references)

The fate of naphthyl-1-^{14}C carbaryl in laying chickens was studied by oral administration of nonradiolabeled carbaryl for 17 days followed by ^{14}C-carbaryl for 14 days at dosages corresponding to 7, 21, and 70 ppm in the diet. Seven days after dosing, 94.5, 0.153, and 0.05% of the dose were recovered in the excrement, eggs, and carcass, respectively. Radiolabeled residues in the excrement, eggs, and tissues were proportional to the dosage level. Residues reached maximum levels within one day in the excrement, two days in egg white, and six to eight days in egg yolk. After discontinuation of dosing, the half-life of ^{14}C residues was < 1 day in the excrement and egg white, two to three days in egg yolk, and five days in the carcass. A metabolite, tentatively identified as 1-naphthyl sulfate, constituted 39.1% of the egg residues. (Author abstract reprinted by permission of the American Chemical Society)

72-1508. Sherman, M.; Beck, J.; Herrick, R. B. (Coll. of Tropical Agriculture, U. of Hawaii, Honolulu, HI 96822). **Chronic toxicity and residues from feeding Nemacide [*O*-(2,4-dichlorophenyl)-*O,O*-diethyl phosphorothioate] to laying hens.** *J. Agr. Food Chem. 20(3): 617-624; 1972.* (16 references)

Technical grade Nemacide [*O*-(2,4-dichlorophenyl)-*O,O*-diethyl phosphorothioate] was administered in the feed of laying hens for 55 wk at 50, 100, 200, and 800 ppm. Excellent control of the housefly, *Musca domestica* L., and the blowfly, *Chrysomya megacephala* (F.), was obtained in droppings from the hens fed 50 ppm but higher levels were required for control of larvae of *Parasarcophaga argyrostoma* (Rovineau-Desvoidy) and *Fannia pusio* (Wiedemann). No hen mortality occurred that could be attributed to treatment but there was a direct relationship between Nemacide concentration and blood plasma cholinesterase inhibition. Feed consumption, weight gain, egg production, shell thickness, egg

weight, egg quality, and odor were normal but eggs from hens treated with 800 ppm had a less desirable flavor than eggs from untreated hens. A GLC electron-capture method was developed to measure nanogram amounts of Nemacide and 2,4-dichlorophenol. The limits of detectability were 0.005 to 0.086 ppm for Nemacide and 0.006 to 0.208 ppm for 2,4-dichlorophenol. Appreciable residues of Nemacide were found in the liver, muscle, fat, and yolk of treated hens, while 2,4-dichlorophenol residues were detected only in the liver and yolk. (Author abstract reprinted by permission of the American Chemical Society)

72-1509. Anderson, K. J.; Leighty, E. G.; Takahashi, M. T. (Columbus Labs., Battelle Memorial Inst., Columbus, OH 43201). **Evaluation of herbicides for possible mutagenic properties.** *J. Agr. Food Chem. 20(3): 649-656; 1972.* (17 references)

One-hundred-and-ten herbicides were evaluated for their ability to induce point mutations in one or more of four different microbial systems. None of the herbicides appeared to cause point mutations in these microbial systems in comparison with known mutagens such as 5-bromouracil or 2-aminopurine. Except for inconclusive evidence relating to four herbicides within one test of one system, mutagenic rates of herbicide-treated organisms did not differ significantly from spontaneous rates. In this one test, four herbicides were associated with mutation frequencies slightly in excess of the control. The observed increases were small, and the rates of mutation were lower than spontaneous rates of controls in other tests of the same system. Therefore, it appears that the increases observed with these four herbicides were within the normal range of spontaneous rates. (Author abstract reprinted by permission of the American Chemical Society)

72-1510. Andersen, K. J.; Cutaia, A. J. (Columbus Labs., Battelle Memorial Inst., Columbus, OH 43201). **Evaluation of bensulide for mutagenic properties in microbial test system.** *J. Agr. Food Chem. 20(3): 656-658; 1972.* (5 references)

The herbicide bensulide was evaluated for its ability to induce point mutations in the T_4 bacteriophage/*Escherichia coli* B system by measuring the frequency of inducing rII-type mutants of T_4 bacteriophage. Statistical analyses of the experimental data suggest that bensulide *per se* is not mutagenic in this particular microbial test system. (Author abstract reprinted by permission of the American Chemical Society)

72-1511. Chiu, Y. C.; Tripathi, R. K.; O'Brien, R. D. (Section of Neurobiology and Behavior, Cornell U., Ithaca, NY 14850). **Differences in reactivity of four butyrylcholinesterase isozymes towards substrate and inhibitors.** *Biochem. Biophys. Res. Commun. 46(1): 35-42; 1972.* (16 references)

Four isozymes of horse serum butyrylcholinesterase were resolved by polyacrylamide gel electrophoresis, specific substrate staining and spectrophotometric scanning. Three minor isozyme bands which remained in the stacking gel during electrophoresis were not studied further. Isozyme I, which had the lowest electrophoretic mobility, accounted for two-thirds of the total enzyme activity, and displayed the lowest Michaelis constant for activity toward butyrylthiocholine chloride. In the other three isozymes, increasing Michaelis constants were found in order of increasing relative mobility. Inhibition by malaoxon and Tetram ® (amiton) also increased in order of increasing relative mobility, although it was only measured for the three slowest-moving isozymes. The proteolytic digestion of butyrylcholinesterase with trypsin led to a 20% loss of activity for the major component, complete disappearance of the second component, and 80% loss of activity for the two remaining components within two hr.

72-1512. Anonymous. **DDT revisited.** *Calif. Health 29(11): 2, 17; 1972.*

Chronic toxicity tests using DDT in four generations of beagle dogs revealed no differences in general condition or reproductive function between treated and control animals. Puberty did, however, occur 60 days earlier in the highest dosage group of DDT-treated females. The DDT dosages used were between 1 mg/kg body weight and 10 mg/kg body weight. A striking decrease in intestinal worm infestation in weanling pups from the highest dosage group of DDT-treated dams was also observed. No impairment following DDT treatment was noted in fertility, number of pups per litter, survival of pups to weaning, sex distributions of live and stillborn pups, or gross and microscopic findings at autopsy. The dogs receiving DDT performed as well as the control dogs in learning trials.

72-1513. Krijnen, C. J.; Boyd, E. M. (Dept. of Pharmacology, Queen's U., Kingston, Ont., Canada). **The influence of diets containing from 0 to 81 per cent of protein on tolerated doses of pesticides.** *Comp. Gen. Pharmacol. 2(8): 373-376; 1971.* (9 references)

During a 4-wk study, the oral LD50 was established for nine pesticides (captan, carbaryl, chlorpropham, DDT, diazinon, endosulfan, lindane, malathion, monuron) in rats receiving diets with concentrations from 0 to 81% of protein as casein. A dietary protein intake of 1/3 the normal intake lowered the growth rate, but did not increase the toxicity more than 1.8 times. In rats fed 3.5% casein (1/7 of normal intake) growth was completely inhibited and susceptibility to pesticides was increased, particularly in the cases of carbaryl and captan. A diet of 0% casein resulted in weight loss and an increase in toxicity of all materials tested. Captan was 2100 times more toxic with a 0% protein diet. Augment-

ing protein intake to three times the optimal level had only minor effects on pesticide toxicity.

72-1514. Harris, L. S.; Mittag, T. W.; Denmark, L. W.; Cohn, K.; Galin, M. A. (Dept. of Ophthalmology, New York Medical College, 1249 Fifth Ave., New York, NY 10029). ***In vitro* effects of diisopropylfluorophosphate on cholinesterases and contractility of intact cat iris.** *Exp. Eye Res. 13(1): 1-8; 1972.* (24 references)

A radiometric technique was used on intact cat irises to differentiate the effects of surface or functional cholinesterase from intracellular enzymes. This allowed correlation of pharmacologic responses with enzymatic responses. Surface or external cholinesterase, 13 to 23% of total activity, had approximately equal amounts of AChe and BuChe. Surface AChe was inhibited 60 to 70% and mecholyl sensitivity increased 20 to 100 fold following application of 2 to 5 μM DFP. Drug sensitivity was completely reversed by 2-pyridine aldoxime methosulfate treatment (2-PAM), and the inhibited surface enzyme was partially reactivated. A 30% fraction of the enzyme appeared to be more rapidly inhibited by DFP and resistant to reactivation by 2-PAM.

72-1515. Ezell, Jr., W. B.; Adkins, Jr., T. R. (South Carolina Agricultural Experiment Station, Clemson U., Clemson, SC). **Use of the electron microscope to detect organic-phosphate-induced demyelination.** *J. Econ. Entomol. 64(6): 1345-1350; 1971.* (9 references)

Experiments were conducted to determine the feasibility of using the electron microscope as a device for detecting, in peripheral nerves, early demyelination caused by organic-phosphate chemicals. Chicken hens were given triorthocresyl phosphate (TOCP) *per os*, then were killed at intervals of 4, 12, 16 and 26 days posttreatment. Other hens were given 9 successive doses of TOCP and were killed 11 and 15 days following the initial treatment. Electron microscopy indicated that demyelination may have occurred as early as 4 days posttreatment during the period prior to development of the paralysis. As expected, the hens which received TOCP became paralyzed within 12 days posttreatment. (Author abstract by permission)

72-1516. Leuck, D. B.; Johnson, Jr., J. C.; Bowman, M. C.; Knox, F. E.; Beroza, M. (Entomology Research Div., ARS, U.S. Dept. of Agriculture, Tifton, GA 31794). **Fenitrothion residues in corn silage and their effects on dairy cows.** *J. Econ. Entomol. 64(6): 1394-1399; 1971.* (17 references)

Silage prepared from corn treated with 1.0, 2.0, and 3.0 pounds per acre of fenitrothion (*O,O*-dimethyl *O*-)4-nitro-*m*-tolyl) phosphonothioate) as an emulsifiable concentrate was fed to lactating Jersey cattle for 8 weeks. Total residues of fenitrothion, the oxygen analog, and its cresol (4-nitro-*m*-cresol) in the silage for the 1.0, 2.0, and 3.0 pounds per acre rates of field application decreased from 4.47, 11.4, and 16.6 ppm on the date of ensiling to 3.41, 6.59, and 9.50 ppm after 128 days of silo storage, respectively. Although traces (0.001 to 0.005 ppm) of the amino analog of fenitrothion were found in the milk of cows fed the 3 pounds per acre silage, no residues (<0.0001 ppm) were found in the milk of cows consuming silage treated at lesser levels. The urine of cows containing total residues averaging from 0.53 to 5.10 ppm consisted mostly of the amino analog plus about 0.1 ppm or less of the parent insecticide and its cresol. Also, feces of the cows contained low levels of residues (0.01 to 0.18 ppm), primarily amino analog plus traces of fenitrothion. Silo seepage contained from 0.008 to 0.448 ppm of total residue consisting mostly of amino analog and the cresol plus traces of fenitrothion. Levels of blood cholinesterase of cows consuming the treated rations were not significantly depressed, and the general health of the animals and their milk production did not appear to be affected. A method of analyzing for the amino-analog in milk, urine, and feces was developed. (Author abstract by permission)

72-1517. Chamberlain, W. F.; Hopkins, D. E.; Barrett, G. C. (Entomology Research Div., ARS, U.S. Dept. of Agriculture, Kerrville, TX 78028). **Absorption and excretion of ^{14}C-labeled Stauffer R-3828 by a steer.** *J. Econ. Entomol. 64(6): 1471-1473; 1971.* (10 references)

When a steer was treated orally with ^{14}C-labeled Stauffer R-3828 (*S*-(*p*-chloro-α-phenylbenzyl) *O,O*-diethyl phosphorodithioate), 90% of the administered dose was eliminated in the urine and feces within 20 days. Of this amount, 52.7% was excreted in the urine. The plotted curves for the amounts of radioactive materials in the blood, urine, and feces were very flat, and there were multiple peaks; however, the greatest quantities occurred at either 48 or 96 hr posttreatment. The elimination of Stauffer R-3828 or its products was slow compared with the elimination of other organophosphorus insecticides. (Author abstract by permission)

72-1518. Clark, P. H.; Cole, M. M. (Entomology Research Div., ARS, U.S. Dept. of Agriculture, Gainesville, FL 32601). **Systemic insecticides for control of oriental rat fleas: preliminary tests in guinea pigs, 1967-1969.** *J. Econ. Entomol. 64(6): 1477-1479; 1971.* (6 references)

Seven systemic insecticides administered orally to guinea pigs caused complete mortality of *Xenopsylla cheopis* (Rothschild) without noticeably affecting the guinea pigs. Four other compounds killed all the fleas but they also killed the guinea pigs. Ten compounds killed 50 to 95% of the fleas, but 3 of the 10 killed the guinea pigs at the dose that killed the fleas. Forty other compounds were ineffective. (Author abstract by permission)

72-1519. Schlinke, J. C.; Palmer, J. S. (Toxicological Research Lab., Veterinary Sci. Research Div., ARS, U.S. Dept. of Agriculture, Kerrville, TX 78028). **Toxicity of two organophosphorous insecticides in stressed cattle.** *J. Econ. Entomol. 65(1): 64-66; 1972.* (2 references)

Two organophosphorus insecticides, dioxathion and Imidan, *O,O*-dimethyl *S*-phthalimidomethyl phosphorodithioate (phosmet), were applied dermally to stressed (tick-infested) cattle. The cattle were observed for signs of toxicosis, and blood cholinesterase (ChE) determinations were made. Emaciated stressed cattle were found to be more susceptible to intoxication when compared with the results of other experiments using normal, healthy cattle. (Author abstract by permission)

72-1520. Radeleff, R. D.; Kunz, S. E. (Veterinary Toxicology and Entomology Research Lab., ARS, U. S. Dept. of Agriculture, College Station, TX). **Toxicity and hazard of diazinon, ethion, and supracide to turkeys.** *J. Econ. Entomol. 65(1): 162-165; 1972.* (3 references)

The single acute oral and dermal doses of diazinon, ethion, and Supracide (*O,O*-dimethyl phosphorodithioate *S*-ester with 4-(mercaptomethyl)-2-methoxy-Δ^2-1,3,4-thiadiazolin-5-one) were determined for 8- and 18-wk-old broadbreasted white turkeys. The hazard to turkeys of exposure to soils treated for control of chiggers was evaluated. Diazinon was the most toxic of the 3 compounds, being lethal for 18-wk-old turkeys at 2 mg/kg orally and toxic at 5 mg/kg dermally. In spite of this rather high toxicity, the hazard provided by exposing the turkeys to soil treated with 16 lb/acre (18 kg/ha) of diazinon seemed minimal in that no birds were poisoned. Soil so treated contained, on each square foot, sufficient diazinon to kill nine turkeys if administered orally or four if administered dermally in single doses. Applications of 64 lb/acre (72 kg/ha) of ethion or Supracide failed to cause poisoning. (Author abstract by permission)

72-1521. Trudgill, P. W.; Widdus, R.; Rees, J. S. (Dept. of Biochemistry and Agricultural Biochemistry, University College of Wales, Aberystwyth, Sy23 3DD, Wales, Great Britain). **Effects of organochlorine insecticides on bacterial growth, respiration and viability.** *J. Gen. Microbiol. 69(Pt. 1): 1-13; 1971.* (45 references)

An investigation of the sensitivity of plate-cultured bacteria to organochlorines as surface films (0.5mg/cm^2) confirmed the previously demonstrated susceptibility of many Gram-positive bacteria and resistance of Gram-negative organisms. The cyclodiene insecticides, with the exception of endrin and telodrin, generally followed this pattern. Technical chlordane inhibited the growth of all the Gram-positive bacteria, tested at 1/100 the concentration of that having no effect on Gram-negative organisms. The pure α- and γ-chlordane isomers showed antibacterial activity, indicating that the cyclodiene itself is an effective antibacterial compound and that the phenomena observed when using the technical material is not due to some chemically unrelated impurity. Growth and respiration were completely inhibited three hours following treatment of *B. subtilis* with 20 ppm chlordane. This dramatic reduction, along with the release of labeled material and leakage of L-malate dehydrogenase from cells, suggested changes in cell permeability or even cell lysis. *E. coli* growth and incorporation of labeled leucine were unaffected by concentrations of chlordane up to 1000 ppm and respiration was not inhibited by concentrations below 660 ppm. In benzyl penicillin-induced sphaeroplasts, however, succinate respiration was chlordane-sensitive while the intact cells were completely resistant, suggesting the *E. coli* complex cell wall might act as a barrier to chlordane.

72-1522. Widdus, R.; Trudgill, P. W.; Maliszewski, M. J. (Dept. of Biochemistry and Agricultural Biochemistry, University College of Wales, Aberystwyth, Sy23 3DD, Wales, Great Britain). **The effects of technical chlordane on energy metabolism of *Bacillus subtilis*.** *J. Gen. Microbiol. 69(Pt. 1): 15-22; 1971.* (34 references)

The effects of technical chlordane on the metabolic steps associated with respiration and energy on chlordane-sensitive *Bacillus subtilis* were investigated. Incubation of membrane preparations with 20 ppm chlordane for one hr yielded the following inhibitions: NADH oxidase, 76%; NADH:acceptor oxidoreductase, 0%; NADH:TTZ oxidoreductase, 53%; and reduced TMPD oxidase, 30%. Whole cell respiration was inhibited 66%. Some tricarboxylic acid cycle enzymes present in a 125,000 X *g* supernatant from *B. subtilis* assayed under the same conditions were also inhibited; this suggested that inhibition of electron transport by chlordane following physical disruption of cytoplasmic membrane is not the sole mechanism of action. ATPase activity was not inhibited during incubation of Mg^{2+} containing membrane fragments with 20 or 100 ppm chlordane.

72-1523. Widdus, R.; Trudgill, P. W.; Turnell, D. C. (Dept. of Biochemistry and Agricultural Biochemistry, University College of Wales, Aberystwyth, Sy23 3DD, Wales, Great Britain). **The effects of technical chlordane on growth and energy metabolism of *Streptococcus faecalis* and *Mycobacterium phlei*: a comparison with *Bacillus subtilis*.** *J. Gen. Microbiol. 69(Pt. 1): 23-31; 1971.* (24 references)

Mycobacterium phlei, which has subcellular systems capable of catalyzing effective oxidative phosphorylation with high P/O ratios, was found to be as sensitive to chlordane as *B. subtilis*. Experiments on the effects of chlordane in this organism revealed significant inhibition of oxidative phosphorylation. Since the sensitivity of cytochrome electron transport is greater than that of phosphorylation, under the conditions employed, this is probably not the target site. Sensitivity of *S. faecalis*, which contains neither a cytchrome chain nor

a functional TCA cycle, was approximately ten fold less than that of *M. phlei*, and loss of viability and lysis were not observed. At growth limiting concentrations of chlordane, fermentation of D-glucose by soluble protein extracts, Na-K-ATPase and cation permeability of the plasma membrane were not inhibited, although D-glucose fermentation did appear inhibited in growing cultures. It is suggested that inhibition of biosynthetic reactions that recycle ATP may be responsible for the effect of chlordane on fermentation in growing cultures.

72-1524. Iverson, F. (Dept. of Biochemistry, North Carolina State U., Raleigh, NC 27607). **The influence of tetraethylammonium ion on the reaction between acetylcholinesterase and selected inhibitors.** *Mol. Pharmacol. 7: 129-135; 1971.* (17 references)

The affinity constant (Ka) and the first-order inhibition rate constant (k2) were determined for several inhibitors of AChe with and without the tetraethylammonium ion (TEA). Although TEA reduction of inhibition by diisopropylphosphorylthiocholine was competitive, the TEA effects on the rates of inhibition by neostigmine and dimethyl carbamylcholine were not as straightforward. With the former, a concentration of 0.5 m*M* reduced the apparent Ka values but increased the apparent k2. Inhibition plots of the latter curved at higher TEA concentrations. It is suggested that TEA and inhibitors are bound simultaneously to the enzyme, with TEA binding to an allosteric site. Inhibitors containing the smaller fluoride leaving group were also found to be affected in different ways by TEA. Inhibition toward diisopropylphosphorofluoridate was purely competitive, while an estimated increase of the first-order sulfonation rate by methanesulfonyl fluoride from 72.5 min^{-1} to 2376 min^{-1} was made in the presence of TEA.

72-1525. Johnson, M. K. (Biochemical Mechanism Section, MRC Toxicology Unit, Woodmansterne Road, Carshalton, Surrey, England). **An approach to the study of the mechanism of organophosphorus delayed toxicity.** *Proc. Roy. Soc. Med. 65(2): 195-196; 1972.* (8 references)

An approach to understanding the mechanism of action of organophosphates in the nervous system is presented, using relevant literature. It is based on the premise that all neurotoxic organophosphates are bonded covalently to a specific site in the nervous system, possibly an esterase, and that the brain, spinal cord and peripheral nerves all have such a site. Failure to observe lesions in the brain might only signify that long axons tend not to maintain their integrity when metabolism of the whole nervous system is disrupted. The study of the biochemistry of the brain has proved to be a satisfactory monitor of the initial event leading to dying-back of long axons characteristic of organophosphate action, and the 'neurotoxic esterase' has been found in homogenates of spinal cord and sciatic nerve. Recent experiments indicate that not loss of esterase activity *per se* but loss of some other function of the esterase molecule when it is phosphorylated causes the axonal degeneration.

72-1526. Cawthorne, M. A.; Murrell, E. A.; Bunyan, J.; Leiper, J. W. G.; Green, J.; Watkins, J. H. (Beecham Research Labs., Nutritional Research Centre, Walton Oaks, Tadworth, Surrey, England). **The effect of ethoxyquin on the mortality of sheep treated with DDT and carbon tetrachloride.** *Res. Vet. Sci. 12(6): 516-520; 1971.* (12 references)

The protection from carbon tetrachloride toxicity afforded by ethoxyquin was studied in experiments with sheep. DDT was used as an inducer of hepatic microsomal enzymes. A marked and reproducible enhancement of carbon tetrachloride toxicity was produced without the undesirable side effects of phenobarbitone, and could be given in one dose. Pretreatment with ethoxyquin 24 to 28 hr prior to carbon tetrachloride administration protected sheep not only from lethal effects, but also from pathological signs in organs and tissue, and fasciolicidal activity was maintained.

72-1527. Sasinovich, L. M.; Voronina, L. Ya. (All-Union Research Inst. Hygiene and Toxicology of Pesticides, Polymers and Plastics of the USSR Ministry of Public Health, USSR). **Aktivnost' fermentov kak diagnosticheskiy test pri porazheniyakh pecheni nekotorymi pestitsidami. [Enzyme activity as a diagnostic test in liver injuries from some pesticides.]** *Fermenty Nar. Khoz. Med. 1971: 213-214; 1971.* (Russian)

Serum and liver enzyme activities in rats and rabbits were studied following intragastric administration over 12 months of 0.05, 0.01, 0.001 or 0.0005 LD50/day of DDT, carbaryl, dichlorvos or methylnitrophos (fenitrothion). All of these compounds produced dose-dependent increases in GOT and GPT activities, the greatest increase occurring with carbaryl and the smallest with fenitrothion. Alkaline phosphatase activity was increased only by carbaryl; it was inhibited by DDT and dichlorvos treatment. Cholinesterase was considerably inhibited following treatment with dichlorvos, fenitrothion or carbaryl, while DDT produced slight increases in cholinesterase activity. Slight increases in sorbitol dehydrogenase were found in the liver after dichlorvos treatment, whereas ornithine-carbamyl tranferase levels remained unchanged in most animals. Enzyme activity tests can be utilized along with other liver function studies in the diagnosis of liver damage due to pesticide exposure.

72-1528. Marchuk, R. Ya.; Lipkan, G. N.; Zaika, A. P.; Kondratyuk, V. I.; Ivanova, Zh. M. (Kiev Research Inst.

Pharmacology and Toxicology of the Ukrainian SSR Acad. of Sciences, Inst. Organic Chemistry, Kiev, USSR). **Detoksikatsiya i antikholinesteraznoye deystviye dvukh predstaviteley ftorangidridov alkilovykh efirov alkiltiofosfonovoy kisloty. [Detoxication and anticholinesterase action of two alkyl thiophosphonic acid alkyl ester fluoroanhydrides.]** *Fiziol. Aktiv. Veshchestva 3: 75-79; 1971.* (3 references) (Russian)

Alterations in cholinesterase activities of rat organs (brain, liver, intestine) and blood were studied following treatment with the isopropyl and ethyl esters of methylfluorothiophosphonic acid. Mortality was recorded after subcutaneous administration of 1.5 mg/kg of the isopropyl ester or 1.0 mg/kg of the ethyl ester. No relationship was observed between toxicity and the anticholinesterase activity determined 1 hr after administration of either compound. *In vitro* experiments revealed a capability for detoxication of the isopropyl ester on the part of rat and rabbit plasma, erythrocytes, intestine, liver and brain, in descending order. Replacement of the isopropyl by the ethyl functional group resulted in complete loss of decontamination ability under the experimental conditions used.

72-1529. Tron'ko, M. D. (Kiev Inst. Endocrinology and Metabolism, Kiev, USSR). **Vplyv khlodytanu (*o,p'*-DDD) na zv'yazuval'nu zdatnist' transkortynu pry zakhvoryuvanni Itsenka-Kushinha. [The binding capacity of transcortin as affected by chlodithane (*o,p'*-DDD) in Itsenko-Cushing's disease.]** *Fiziol. Zh. (Kiev) 16: 844-845; 1970.* (7 references) (Ukrainian)

Seven patients with Cushing's disease (two males, 23 and 30 years old, and five females, 30 to 40 years old) were treated with *o,p'*-DDD (TDE). Each was given 3 to 6 g per day, then 8 to 10 g per day of a 25% corn oil preparation of TDE for 51 days. The average initial plasma hydrocortisone level of 24.4 μg/100 ml decreased to 17.2 μg/100 ml after the first course of therapy. However, the binding capacity of transcortin showed no improvement, despite the improved clinical condition observed in all patients. The decreased binding of hydrocortisone by transcortin observed before and after treatment with TDE was attributed to alterations in transcortin biosynthesis.

72-1530. Rueckert, W.; Ballschmiter, K. (Institut fuer Anorganische Chemie und Kernchemie der Johannes Gutenberg-Universitaet, Mainz, Germany). **Metabolismus der Cyclodien-Insecticide Alodan® und Endosulfan (=Thiodan®) in Fliegen. [Metabolism of the cyclodiene insecticides Alodan® and endosulfan (=Thiodan®) in houseflies.]** *Fresenius Z. Anal. Chem. 259(3): 188-190; 1972.* (12 references) (German)

The oxidative metabolism of the cyclodiene insecticides endosulfan (1,4,5,6,7,7-hexachloro-norbornene-2,3,-bis-methylene cyclic sulfite) and Alodan® (1,4,5,6,7,7-hexachloro-norbornene-2,3,-bis-chloromethylene) in the house fly (*Musca domestica*) is shown to proceed to the cyclic derivative of a carbonic acid and an aldehyde function in position 2 and 3, respectively, of the hexachloro-norbornene. The methyl or ethyl derivatives of the cyclic hydroxylactone, gained, e.g., by BF_3-catalyzed etherification, are easily extracted with toluene and can be detected by electron-capture gas-chromatography. (Author abstract by permission)

72-1531. Otsuka, J. (Author address unknown). **[A follow-up report on eye damage caused by organophosphate pesticides.]** *Ganka (Ophthalmology) 13(7): 715; 1971.* (Japanese)

The implication of organophosphate pesticides in the etiology of certain ocular abnormalities observed in Japan continues to be disputed. To provide further data on this subject, one group of beagles was given 5, 10 or 15 mg of Ekatin (thiometon) per day, and another, Ekatin plus Padrin (pyrodifenium bromide). Optical refraction, keratometric radius, retinal curvature and the length of the optical axis were measured, and compared with the blood cholinesterase levels for each group. The optical axes in the Ekatin group were long, and a tendency toward nearsightedness was apparent, along with various degrees of optic neuritis. The control group displayed normal refraction and a short optic axis. The Ekatin/Padrin group was midway between these two, with some variations. A significant inverse correlation between blood cholinesterase level and the length of the optic axis was found.

72-1532. Geleriu, R.; Straus, H.; Ghelberg, N. W.; Costin, I. (Institutul de Medicina si Stiinte Farmaceutice, Cluj, Rumania). **Influenta aeroionilor pozitivi si a detergentilor asupra toxicitatii Carbetoxului. [Influence of positive air ions and detergents on the toxicity of Carbetox.]** *Igiena 20(1): 47-55; 1971.* (27 references) (Rumanian)

Serum protein patterns in rats were examined in order to determine the effects on liver function of peroral administration of Carbetox (containing 30% malathion) alone, or in combination with a detergent, and with or without prior exposure to positive atmospheric ions. Carbetox was administered daily at a dosage of 185.6 mg/kg body weight along with 10 mg/kg body weight of Perlan for 20 days and resulted in the death of 60% of the rats; however, no deaths occurred when Carbetox was given alone under the same experimental conditions. Serum protein alterations, including a drop in α_2 and β_1 globulins, were more pronounced in rats treated with the insecticide-detergent combination than in those given insecticide alone. Serum albumin was reduced in 50% of the rats treated with Carbetox plus Perlan. SGOT values were appreciably elevated in rats treated with Carbetox, alone or in combination with detergent, following exposure to positive air ions.

72-1533. van Tienhoven, A.; Duby, R. T. (Dept. of Poultry Science, Cornell U., Ithaca, NY). **Lack of oestrogenic effect of *o,p'*-DDT on the implantation of rat blastocysts.** *J. Reprod. Fert. 28: 87-89; 1972.* (11 references)

The effect of *o,p'*-DDT on implantation of blastocysts in medroxyprogesterone-treated rats or on implantation in recently mated rats was investigated. Neither *p,p'*-DDT or *o,p'*-DDT (1 mg, s.c.) induced implantation in medroxyprogesterone-treated rats, although implantation was induced by oestradiol. In rats treated on days one, two, and three of pregnancy with *p,p'*-DDT or *o,p'*-DDT incidence of implantation was unaffected.

72-1534. Preiss, D.; Haag, D.; Goerttler, K. (Pathologisches Institut der U. Heidelberg, Heidelberg, Germany). **Beeinflussung der DNS-Reduplikation kultiviertier embryonaler Skelettmuskelzellen durch das Herbicid 2,4-Dichlorphenoxyessigsaeure. [Influence of 2,4-D on DNA replication in embryonic skeletal musculature cells in cell culture.]** *Naturwissenschaften 59(4): 173; 1972.* (9 references) (German)

The sodium salt of 2,4-D was added to the 11-day-old cultures media of embryonic chicken skeletal muscle cells at 2.5 mMol/l. After 22 or 44 hours, the cells were collected, fixed in alcohol, and fluorochromed. The fluorescence intensity of the nucleus was taken as a measure of DNA content, and used to calculate the fraction of the cells in each developmental stage. In the 44-hour cultures, the number of cells in the tetraploid (G2 + M) phases was distinctly reduced. Morphological examination of these cells revealed chromatin lysis, nuclear fragmentation and appreciable reductions in the cytoplasmatic portion. The effects of 2,4-D on DNA replication may be interpreted as a prolongation of the relative S-phase duration within the cell cycle, or as a reduction in the DNA-synthesizing capacity.

72-1535. Buu-Hoi, N. P.; Chanh, P-H.; Sesque, G.; Azum-Gelade, M. C.; Saint-Ruf, G. (Centre National de la Recherche Scientifique, Paris, France). **Enzymatic functions as targets of the toxicity of "dioxin" (2,3,7,8-tetrachloro-dibenzo-*p*-dioxin).** *Naturwissenschaften 59(4): 173-174; 1972.* (10 references)

Serum enzyme levels and serum components in rats were determined following i.p. injection of 10 mg/kg 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. Controls were given onlv the olive oil vehicle. A marked elevation was observed in glutamic oxalacetic transaminase, lactic dehydrogenase and hydroxybutyric dehydrogenase. Arylesterase and cholinesterase were depressed. Other serum parameters which were affected included glucose, sodium, bilirubin, protein, total lipids and urea. The liver appears to be a target of "dioxin" intoxication.

72-1536. Buu-Hoi, N. P.; Chanh, P-H.; Sesque, G.; Azum-Gelade, M. C.; Saint-Ruf, G. (Centre National de la Recherche Scientifique, Paris, France). **Organs as targets of "dioxin"(2,3,7,8-tetrachlorodibenzo-*p*-dioxin) intoxication.** *Naturwissenschaften 59(4): 174-175; 1972.* (5 references)

Following i.p. administration to rats of 1 and 10 mg/kg 2,3,7,8-tetrachlorodibenzo-*p*-dioxin, organ damage was observed along with weight loss and hematologic effects. Hepatic lesions included pronounced anisokaryosis, frequent binucleation, cytoplasm loaded with chromophobe vacuoles and hyaline inclusions, a focal hyperplasia of the Kupffer cells, and sometimes the presence of voluminous plasmodes along side the binucleated hepatocytes. The thymus showed diffused pyknosis of the thymocytes and an inversion or total involution of the structure. Valvulitis and deep focal lesions were observed in the heart, and the lungs were also affected.

72-1537. Suzuki, S. (Sumitomo Chemical Industries Ltd., Osaka, Japan). **[Fenitrothion (Sumithion).]** *Noyaku Seisan Gijutsu (Pestic. Tech.) 22: 57-69; 1970.* (33 references) (Japanese)

Sumithion is an organophosphate insecticide specifically synthesized for its extremely low toxicity in man and animals. In subacute toxicity tests, 32 to 500 ppm of Sumithion was given to rats in their feed for 90 days. Only one death occurred among the 17 rats in the highest dosage group and there were no weight changes. Slight dose-dependent decreases in kidney, liver, brain and blood cholinesterase were noted. The oral LD50 of Sumithion in the rat is 200 mg, whereas that for methyl parathion is 24.5 mg/kg; in the mouse, it is 870 mg/kg, whereas that of methyl parathion is 17 mg/kg; and in the guinea pig, it is 1850 mg/kg for Sumithion and 417 mg/kg for methyl parathion. It leaves almost no residues in beef. There has been only one example of a 0.14 ppm residue level, which was in the meat of a steer that had consumed close to 7 ppm Sumithion. According to a test conducted at Shimane University, milk obtained from cows weighing 400 to 450 kg and fed 1 to 3 mg/kg/day of Sumithion contained residues in the range of 0.001 to 0.002 ppm. Sumithion was administered for seven days, and the milk was analyzed for two weeks after the first administration.

72-1538. Reznikov, A. G. (Kiev Research Inst. of Endocrinology and Metabolism, Kiev, USSR). **Izucheniye nekotorykh reaktsiy biosinteza kortikosteroidov u sobak posle vyedeniya *o,p'*-DDD. [Studying some corticosteroid biosynthesis reactions occurring in dogs following administration of *o,p'*-DDD.]** *Probl. Endokrinol. 16: 56-58; 1970.* (14 references) (Russian)

Administration of *o,p'*-DDD (TDE) to dogs (50 mg/kg body wt. daily for 2 wks) produced a 4-fold decrease in 11-hydroxycorticosteroid synthesis in adrenal gland slices *in vitro*. Considerable decreases in

Δ^5-3β-hydroxysteroid dehydrogenase and 11β-hydroxylase activities indicated that the inhibitory action of TDE on corticosteroid biosynthesis is focused on the key reactions of steroidogenesis including pregnenolone conversion into Δ^4-3β-ketosteroids and 11β-hydroxylation of steroids. Inhibition appeared to occur at the earliest stages of corticosteroid biosynthesis, thus preventing the synthesis of hydrocortisone, corticosterone and aldosterone. The observed decreased enzyme activities can be due either to direct TDE interactions with the steroidogenesis enzymes or to its cytotoxic activity upon the adrenal cortex.

72-1539. Halacka, K.; Dvorak, M.; Cerny, E. (Medizinische Fakultaet der J. E. Purkyne-Universitaet, Brno, Czechoslovakia). **Einfluss kleiner Dosen von Heptachlor auf die Ultrastruktur der Leberzellen. [Effects of heptachlor at low doses on the ultrastructure of liver cells.]** *Prot. Vitae 1: 18-21; 1972.* (5 references) (German)

In preliminary experiments, heptachlor was administered at 2, 4, or 8 mg/kg body weight to white mice and rats for two weeks and to one miniature laboratory pig at 2 mg/kg for 17 days, then at 5 mg/kg for 23 days. No changes in gross liver morphology were noted, except for slight steatosis in the rodents. Optical microscopy of tissue sections revealed isolated areactive oligocellular hepatocytic necroses, especially in the highest dosage groups. With an electron microscope the changes observed in the liver cells were more extensive, consisting primarily of the formation of vacuoles containing lipid-like matter. The granular endoplasmatic reticulum showed dilatation and changes in the dislocation of ribosomes at the membrane, along with an increased number of reticular structures. In some cases, an increase in the Golgi system was found. Alterations in the mitochondria were found at the higher dosages. More extensive experiments are planned.

72-1540. Vaisman, S.; Pizzi, T.; Rivera, G.; Del Rio, A. Beresi, V.; Del Pozo, H. (C. Mackenna Hospital, Santiago, Chile). **Adenocarcinoma suprarrenal. [Adenocarcinoma of the adrenal gland.]** *Rev. Chil. Pediat. 42: 175-181; 1971.* (8 references) (Spanish)

A case of adrenal adenocarcinoma associated with Cushing's syndrome in an 8-yr-old girl is described. Normalization of urinary 17-ketosteroids occurred following surgery, but high levels of both 17-ketosteroids and 17-hydroxycorticosteroids appeared in the patient's urine during the last months preceding death. Reference is made to literature recommending treatment with *o,p'*-DDD (TDE) to control the levels of the above steroids following surgery. The action of TDE is attributed to its partial inhibitory effects upon adrenal glucose-6-phosphate dehydrogenase. Of two children treated with TDE, one died 17 months following diagnosis of the adrenal tumor; the other child presented favorable results but no clearcut diagnosis was available as to whether the tumor was an adenoma or an adenocarcinoma.

72-1541. Sedov, A. I. (Regional Office of Forensic Medical Investigation, Donetsk, USSR). **Raspredeleniye sevina v organakh i sokhranyayemost' yego v trupe. [Distribution of Sevin in the organs and its persistence in cadaver tissues.]** *Sud. Med. Ekspertiza 14(3): 43-46; 1971.* (Russian)

The distribution and persistence of Sevin (carbaryl) and of its main metabolite, α-naphthol, in cadaver tissue following acute poisoning were studied. Dogs were given 1200 mg/kg carbaryl in alcohol solution via stomach tube. Death occurred within 1 to 1.5 hr. Benzene extracts of various organ samples were dissolved in known amounts of ethanol and chromatographed on alumina layers with chloroform-benzene-acetone (7:2:1) as a carrier system. Carbaryl and α-naphthol were identified with a copper bromide and diazotized sulfanilic acid reagent. Quantitative determination following elution with methanol was made by colorimetry following reaction with 4-aminoantipyrine. The largest amounts of carbaryl and α-naphthol were found in stomach and stomach contents, small and large intestine, liver, kidney, heart and lung; smallest amounts were found in blood, spleen, pancreas, muscles, brain, and urine. Peak amounts of α-naphthol were found in the liver, gastrointestinal tract, kidney, and lung. The urine contained 0.06 to 0.13 mg/100 g of bound and only traces of free α-naphthol. The presence of carbaryl was detected after one year of liver sample preservation with ethanol. Alpha-naphthol was detected after 90 days of liver preservation as a result of partial carbaryl hydrolysis.

72-1542. Sadriyeva, R. V.; Absalyamov, I. F. (I. P. Pavlov Samarkand Med. Inst., Samarkand, USSR). **Dinamika morfologicheskikh izmeneniy v slizistoy obolochke nosa krolikov pri dlitel'nom peroral'nom vvedenii metilmerkaptofosa. [Morphological alteration dynamics of the rabbit nasal mucosa during prolonged peroral methyl mercaptophos administration.]** *Zh. Ushn. Nos. Gorl. Bolezn. 30: 9-11; 1970.* (6 references) (Russian)

The dynamics of morphological alterations in rabbit nasal mucosa were studied after daily administration of a methyl mercaptophos solution (70 mg/kg body wt p.o.). Acute damage occurred during the first 50 days of treatment. Edema and dilatation of the vascular walls and perivascular spaces were observed by the tenth day; hyperemia, mucosal hypersecretion and increased goblet cell counts were observed after 15 days; and decreased hyperemia and increased leukocyte counts in the blood stream were observed 30 days after the beginning of the experiment. Proliferation of the submucosal layer along with thickening and polypoid formations in the mucous

membrane were observed after 50 days of treatment. The alterations of the nasal mucosa assumed a chronic character, including a thickening of the nasal mucosa from connective tissue proliferation, after 50 to 75 days of treatment. An improved condition of the nasal mucosa, representing only moderate dystrophy, was observed after 104 days of poisoning. The action of methylmercaptophos seems to be focused on the vascular receptors; the dystrophic and inflammatory processes reaching their maximum 40 to 50 days after the beginning of the experiment are attributed to an impairment of organ defenses by methylmercaptophos. Improvement after 104 days of poisoning is probably due to a process of adaptation to the pesticide.

72-1543. Guseynov, M. M. (Order of Lenin Central Inst. Postgraduate Training of Physicians, Kirovabad, USSR). **Izmeneniye funkstii mertsatel'nogo epiteliya pishchenova lyagushki pri vozdeystvii 5.5 dusta DDT, 1% rastvora Bordosskoy zhidkosti i molotoy sery. [Functional alterations of the ciliated epithelium occurring in the frog esophagus from 5.5% DDT dust, 1% Bordeaux solution and ground sulfur.]** *Zh. Ushn. Gorl. Bolezn. 31: 96-98; 1971.* (4 references) (Russian)

Application of a 5.5% DDT dust preparation (including 94.5% of a talcum and chalk powder mixture) to the surface of frog esophageal mucosa produced inhibition of the vibratile function of the ciliated epithelium within 3 to 4 min. Removal of the dust by washing with a 0.5% baking soda solution restored the ciliar function within 1 min. Treatment of the esophageal epithelium with 1% Bordeaux solution (a mixture of copper sulfate and lime water, 4:3) produced a sudden disruption of vibratile movement of the ciliated epithelium; whose function was restored 4-6 min after the removal of the solution and upon washing with the above mentioned soda solution. Sulfur powder produced slight alterations in the ciliated epithelium, associated with no functional impairment.

See also **72-1370** **72-1400** **72-1401** **72-1431** **72-1441**

72-1544. Das, D. K.; Mathew, T. V.; Mukherjee, A. K.; Mitra, S. N. (Central Food Lab., Calcutta, India). **Quantitative estimation of malathion in cereals.** *Res. Ind. 16(1): 43-44; 1971.* (4 references)

A rapid, quantitative method for the determination of malathion residues in cereals has been devised which utilizes paper chromatography. A sample was prepared by making a powder of 100g of material and blending it with acetonitrile. The extract was filtered and evaporated to dryness, and the residue was taken up in petroleum ether and spotted on Whatman No. 1 paper which had been washed, dried and treated with 4% soyabean oil in ethyl ether. The carrier solvent was 85% methanol and spots were developed with 0.5% palladium chloride in 5% HCl. Spots were eluted for quantitation with a 1:1 mixture of formic and acetic acids, and color intensity was measured in a Klett-Summerson photoelectric colorimeter.

72-1545. Visweswariah, K.; Jayaram, M.; Majumder, S. K. (Discipline of Infestation Control and Pesticides, Central Food Technological Research Inst., Mysore 2A, India). **Colorimetric method for the estimation of dichlorovos (DDVP).** *Res. Ind. 16(1): 45-46; 1971.* (12 references)

A colorimetric method for the determination of dichlorvos at levels from 19 to 228 μg is described. Dichlorvos standards in monoethanolamine were held at boiling temperature for 30 min to hydrolyze the chemical. After dilution with ethanol: water (1:1) the color resulting from the presence of the aldehyde was measured immediately at 420 nm. Beer's law was obeyed in estimates of standards and assays of known formulations and the accuracy of the method was ± 1.5%.

72-1546. Kratky, B. A.; Warren, G. F. (Dept. of Horticulture, Purdue U., Lafayette, IN 47907). **A rapid bioassay for photosynthetic and respiratory inhibitors.** *Weed Sci. 19(6): 658-661; 1971.* (13 references)

A bioassay for photosynthetic and respiratory inhibitors was devised. The chlorophyll production of *Chlorella pyrenoidosa* Sorokin, high temperature strain 7–11–05, served as the basis of the bioassay which required 18 to 36 hr to complete. The sensitivity to nine photosynthetic and two respiratory inhibitors ranged from 0.013 to 0.4 ppm. The bioassay was successfully employed to assay leachates from soil columns and to monitor a field residue of 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine (atrazine). (Author abstract by permission)

72-1547. Helling, C. S.; Kaufman, D. D.; Dieter, C. T. (U. S. Dept. of Agriculture, ARS, Beltsville, MD 20705). **Algae bioassay detection of pesticide mobility in soils.** *Weed Sci. 19(6): 685-690; 1971.* (35 references)

Movement of pesticides on soil thin-layer chromatographic (TLC) plates was detected by a bioassay employing a green alga, *Chlorella sorokiniana* Shihira and Krauss. After leaching the soil TLC plates with water, a *Chlorella* suspension in an enriched agar medium was aspirated onto the soil to give ca. 8×10^6 cells/cm^2. Plates were incubated at 100% relative humidity at 30°C, with illumination of ca. 40 klux. Zones of pesticide movement were visible within 24 to 48 hr. Mobility in Hagerstown silty clay loam was assessed for two methylcarbamate insecticides and for nine phenylurea, 11 *s*-triazine, and 13 miscellaneous herbicides. Among analogous triazines, the mobility order was: $-OCH_3 > -Cl > -SCH_3$. Movement of 6,7-dihydropyrido[1,2-*a*:2′1′-*c*]pyrazidiinium ion (diquat) and 1,1′-dimethyl-4,4′-bipyridinium ion (paraquat), normally immobile in soils, was directly proportional to rate when applied in high doses. (Author abstract by permission)

72-1548. Kawahara, T.; Fujimoto, Y. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Studies on a method for analysis of DDT residues in green tea.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 10(5): 41-44; 1970.* (4 references) (Japanese)

Two sample preparation methods for analysis of DDT residues in green tea were compared: method A (extraction with acetone and Nuchar-Attaclay cleanup) and method B (acetonitrile extraction and Florisil cleanup). Extraction with acetone or acetone:*n*-hexane 1:1 gave efficient recovery; however, method B offered improved separation and detectability, although it was more time-consuming. In both cases, Soxhlet extraction was preferable to merely immersing the tea in the solvent. Chlorophyll removal and extract concentration were unsatisfactory with method A, and a large unknown peak was obtained in the gas chromatogram. Analyses of prepared tea infusions demonstrated that about 2% of the DDT present is eluted from green tea by water at 60°C. High DDT levels were found in some of the tea samples analyzed (14 and 28 ppm of *p,p′*-DDT in two Hawaiian samples), probably due to direct application of DDT to tea plants. (From author abstract)

72-1549. Kawahara, T. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Determination of 3,4-dimethylphenyl *N*-methylcarbamate (MPMC) by electron capture gas-liquid chromatography.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 10(5): 45-47; 1970.* (1 reference) (Japanese)

A solution of reagent-grade MPMC in methylene chloride was hydrolyzed by adding a 0.1 *N* solution of NaOH in methanol. The resulting solution was condensed under reduced pressure, acidified with 1 *N* sulfuric acid, then 20 ml of water added and the solution distilled under reduced pressure. The distillate was collected in 20 ml of 0.1 *N* KOH, and then a quantity of 2,4-dichlorophenol equal to the weight of the MPMC originally present was added as an internal standard. The

solution was acidified with 1 *N* sulfuric acid and extracted three times with 20 ml of ether. The ether extracts were combined, washed twice with 10 ml of distilled water each time, and evaporated under reduced pressure. Then the following were added to the residue, in order: 5 ml benzene, 15 ml of 0.25 *N* NaOH solution, and 5 ml of chloroacetic anhydride solution. The solution was shaken for 2 minutes and analyzed for 3,4-xylenol chloroacetate by electron-capture gas chromatography. Recoveries of about 75% for 0.05 ppm MPMC and 80% for 0.1 ppm MPMC were obtained. Further steps will have to be added for cleaning up extracts from food and other products. (From author abstract)

72-1550. Ishii, Y. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Determination of carbaryl (1-naphthyl *N*-methyl carbamate) in fish tissues by spectrophotofluorescence.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 10(5): 51-52; 1970.* (2 references) (Japanese)

Carbaryl was extracted from fish tissues with methylene chloride and the solution evaporated to dryness. The residue was taken up in 20 ml of *n*-hexane and transferred to a separatory funnel, then extracted three times with 10-ml portions of acetonitrile. The extracts were combined and concentrated to about 2 ml. The concentrate was spotted on a thin-layer plate (Silica gel, Merck HF 254, 20 X 20 cm, 0.5 mm thick) and developed with *n*-hexane: ethyl acetate (3:2 v/v) as a solvent. The carbaryl spot was scraped off and extracted with methanol. The fluorescence of the methanolic solution was determined for the fluorescence maxima at 265 and 333 nm. The quenching factor was found to be 80.3%, and the recovery at 1 ppm averaged 96.8%. (From author abstract)

72-1551. Baba, H.; Sakurai, H.; Nakamura, H. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Bioassay of polyoxin D zinc salt residues in rice.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 10(5): 79-82; 1970.* (3 references) (Japanese)

Polyoxin D residues in rice were determined by the cup-plate method using *Pellicularia sasakii* ACI 1134 as the test organism. The nutrient medium contained 10 ml of V-8 juice, 0.5 g L-asparagine, 0.5 g dibasic potassium phosphate, 10 g sucrose and 1000 ml water, adjusted to a final pH of 6.0. Rice samples were obtained from fields treated one to three times with polyoxin D zinc salt and were finely ground; EDTA and α-amylase were added. The sample was extracted with water and the extract cleaned up on Dowex 50W X-2(H) and Amberlite IRC-50(H) columns. The eluate was first concentrated, then made up to 40 ml with phosphate buffer. Polyoxin D in the sample was permitted to diffuse for 24 hours at 5°C before incubation. The average recovery from the extraction procedure was 77% when polyoxin D was added to untreated rice at 1 ppm. In all 10 rice samples tested, the residues were below the limit of detection of 0.1 ppm. (From author abstract)

72-1552. Kawahara, T.; Yokota, T. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 3. The amounts of pesticides lost during evaporation procedures.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10): 45-46; 1971.* (Japanese)

The fractions of pesticides lost during concentration of solutions for analysis depend on the material and technique used. The loss of BHC isomers occurred in the order α-BHC > γ-BHC (lindane) > δ-BHC > β-BHC. The average recovery for the four BHC isomers was 97.5% in the rotary evaporator, 98.6% in the Kuderna-Danish condenser, 94.5% by simple evaporation at reduced pressure (28 min in a water bath at 40°C), and 81.7% by evaporation under ambient pressure (64 min in a water bath at 70°C). Recovery of EPN after concentration amounted to 81.3% in the rotary evaporator, 84.0% in the K-D condenser, and 75.3% under reduced pressure. EPN losses were reduced when a small quantity of solvent containing EPN was evaporated by passing an air current over the sample. (From author abstract)

72-1553. Kawahara, T.; Moku, M. (Agricultural Chemicals Inspection Station, Tokyo, Japan). **[Organochlorine pesticide residues in agricultural products and soil. Part 4. Extraction of chlorinated hydrocarbons from soil.]** *Noyaku Kensasho Hokoku (Bull. Agr. Chem. Insp. Sta. (Jap.)) 11(10: 47-50; 1971.* (2 references) (Japanese)

Methods of shaking, blending and Soxhlet extraction were compared in extracting chlorinated hydrocarbons from the soil; the four isomers of BHC, *p,p'*-DDT, *o,p'*-DDT, aldrin, dieldrin and endrin were extracted. The solvents used were acetone or a 7:3 mixture of acetone and water. Shaking gave the highest pesticide recoveries, except for the extraction of *p,p'*-DDT, aldrin and endrin, where greatest recoveries were attained by Soxhlet extraction. Blending and Soxhlet extraction generally gave similar results, slightly inferior to those from shaking. Graphs of the quantity extracted versus shaking time gave maximum recoveries after shaking for one hour, and the gas chromatogram of the extract gave good separation with only one unidentified peak. (From author abstract)

72-1554. Seiber, J. N.; Markle, J. C. (Dept. of Environmental Toxicology, U. of California, Davis, CA 95616). **Hydrolysis and solvent partition of Phosdrin and related organophosphates.** *Bull. Environ. Contam. Toxicol. 7(2/3): 72-74; 1972.* (7 references)

Past studies on Phosdrin (mevinphos) hydrolysis have yielded conflicting results. While one investigation found phosdrin hydrolyzes rapidly in aqueous solution, others employing a variety of techniques and using re-

lated pesticide values, found this not to be the case. In the first mentioned study, Phosdrin hydrolysis was estimated by determining the unhydrolyzed compound in hexane extracts of aqueous solutions. The present study revealed that only 14% of the α-isomer of Phosdrin and 2% of the β-isomer was extracted from water with *n*-hexane under the conditions described, whereas about 95% of both isomers were extracted with chloroform. The partitioning results for Azodrin (monocrotophos) and Bidrin (dicrotophos) were similar. In a single step about 66% of the DDVP (dichlorvos) present in an aqueous solution was extracted with hexane, compared to 99% with chloroform. About 96% of methyl parathion was extracted from water with either hexane or chloroform. The previous experiments were repeated using chloroform extraction to obtain unreacted Phosdrin for determination. They revealed that only 6% hydrolysis occurs within 1 week, at pH 6, which agrees with the majority of other studies.

72-1555. Chau, A. S. Y.; Wilkinson, R. J. (Dept. of the Environment, Water Quality Div., Ottawa, Ontario, Canada). **Some separation characteristics of an OV-101/OV-210 column for organochlorinated pesticides with particular reference to the separation of photoendrin and endrin.** *Bull. Environ. Contam. Toxicol. 7(2/3): 93-104; 1972.* (9 references)

A gas chromatographic column was prepared by weighing 0.8 g of OV-101 and 1.2 g of OV-210 (silicone oils) in a round-bottom flask, covering with 200 ml of ethyl acetate, and heating under light reflux until the silicones dissolved. Then 20 g of chromosorb W, AW, DMCS treated, 80-100 mesh, were added and the flask heated gently with periodic swirling for 2 hr. After evaporation of the solvent, drying, and conditioning, the column material was placed in one of two columns of a gas chromatograph with dual electron-capture detectors. The other column was packed with 4% DC-11 and 6% QF-1 on Chromosorb for comparison. Photoendrin was prepared by irradiating a solution of endrin in hexane with UV light for 78 hr. Bubbling nitrogen through the solvent reduced the formation of endrin ketone. The new column provided good separation of endrin and photoendrin without extensive preconditioning, and gave a single sharp endrin peak due to absence of thermal isomerization, thus lowering the endrin detection limit. Another advantage of the mixed column was its increased sensitivity to 1-hydroxychlordene and 1-hydroxy-3-chlorochlordene, important heptachlor decomposition products. Separation properties of the new column for other organochlorine pesticides were also good.

72-1556. Hesselberg, R. J.; Johnson, J. L. (Great Lakes Fishery Lab., Ann Arbor, MI 48107). **Column extraction of pesticides from fish, fish food and mud.** *Bull. Environ. Contam. Toxicol. 7(2/3): 115-120; 1970.* (10 references)

Twenty-gram samples of pesticide-spiked mud, fish food or frozen ground fish were blended with 80 g of anhydrous sodium sulfate, then placed on top of a glass-wool plug and a layer of 2 g sodium sulfate in a chromatographic column, and lightly tamped. In accordance with the pesticide to be extracted, 200 ml of a suitable solvent was allowed to flow through and collected, then evaporated to give a 3-ml sample volume. Cleanup consisted of partitioning into acetonitrile from hexane and passing over a Florisil column. Recovery of pesticides from samples prepared by this method ranged from 83% for simazine from mud, to 100% for 2,4-D, DDT and parathion from whole fish, and for DDT from fish food. In a comparative test on native fish without added pesticide, the column method allowed extraction of twice as much DDE and TDE as the blender extraction method, with a low standard error.

72-1557. Levi, I.; Nowicki, T. W. (Grain Research Lab., Canadian Grain Commission, Winnipeg, Canada). **Spurious GLC peaks in cereal grains stored in cloth bags.** *Bull. Environ. Contam. Toxicol. 7(2/3): 133-136; 1972.* (1 reference)

An attempt was made to determine the source of the spurious peaks in gas chromatograms of grain samples stored in cloth bags prior to analysis for chlorinated hydrocarbon residues. Soiled used cloth bags and clean unused cloth bags were stripped with a 3% ethyl ether in hexane solvent system and the extracts cleaned up on a Florisil column. The gas chromatogram of the extract from the soiled cloth bags contained a large number of high peaks, especially in the early eluting portion. Some of these peaks had retention times identical to those of known pesticides. Extracts from the clean bags gave a smaller number of peaks, especially in the early eluting region. Four different grain samples were divided into two portions each. One portion of each was stored in a cloth bag and the other in a kraft envelope for one week, then the grain analyzed according to the standard Canadian procedure for organochlorine pesticide residues. Gas chromatograms from the samples stored in kraft envelopes displayed no significant peaks, whereas a large number of gas chromatographic peaks occurred for the samples stored in the cloth bags.

72-1558. Young, S. J. V.; Burke, J. A. (Div. of Chemical Technology, Bureau of Foods, Food and Drug Admin., Washington, DC 20204). **Micro scale alkali treatment for use in pesticide residue confirmation and sample cleanup.** *Bull. Environ. Contam. Toxicol. 7(2/3): 160-167; 1972.* (8 references)

Alkali treatment for dehydrochlorination of organochlorine pesticides may be useful in confirming the identity of some residues and in removing interfering substances. Substances removable by the method described include polychlorinated biphenyls (PCBs), fats, and electron-capturing carotenoid and sulfur-containing

substances. Boiling a sample extract in petroleum ether with ethanolic KOH for about half an hour resulted in complete conversion of *p,p'*-DDT, *o,p'*-DDT, *p,p'*-TDE, *o,p'*-TDE, methoxychlor, and perthane to the corresponding olefins. PCBs, which are stable to this treatment, were recovered completely unchanged. Aldrin, dieldrin and endrin were recovered unchanged to the extent of 70 to 90%; recoveries of the original compound in the case of heptachlor and heptachlor epoxide were between 30 and 50%. All BHC isomers were completely converted. Additional studies are being performed on derivatives obtained from mirex, endosulfan, dicofol, and toxaphene after micro-alkali treatment.

72-1559. Levi, I.; Nowicki, T. W. (Grain Res. Lab., Canadian Grain Commission, Winnipeg, Manitoba, Canada). **Interfering GLC peaks from materials and chemicals in pesticide residue analysis.** *Bull. Environ. Contam. Toxicol. 7(4): 193-199; 1972.* (5 references)

In testing cereal grains for organochlorine pesticide residues, spurious peaks were found in gas chromatograms utilizing an electron-capture detector (GLC-ECD). Five types of apparatus and reagents were used. Reagent-grade sodium sulfate, unwashed and acid-washed filter papers, wash bottle assemblies, soiled Teflon gaskets and silane-treated glass wool, all washed with ether plus hexane, yielded gas-chromatographic peaks with elution times similar to those of some pesticides. Most of the impurities in the sodium sulfate were removed by heating at 600°C for two hrs or by washing with a solvent system. The filter paper contamination level was reduced by soaking the paper in a solvent system overnight, then rinsing three or four times with solvent. Spurious peaks could not be eliminated from Unitized glass bottles, but could be eliminated from an all-glass wash bottle with side-arm pump by removing the rubber pump, substituting a rubber bulb which was removed when refilling the bottle. Teflon gaskets should be discarded periodically, since they can absorb and retain impurities from other sources. Glass wool may be used after heating for two hours at 600°C. Precautions should be taken to avoid contamination whenever rubber articles are used.

72-1560. Uk, S.; Himel, C.; Dirks, T. (Dept. of Entomology, U. of Georgia, Athens, GA 30601). **Mass spectral pattern of mirex (dodecachlorooctahydro-1,3,4-metheno-2*H*-cyclobuta [*cd*] pentalene) and of Kepone (dodecachlorooctahydro-1,3,4-metheno-2*H*-cyclobuta [*cd*]-pentalen-2:application in residue analysis.** *Bull. Environ. Contam. Toxicol. 7(4): 207-215; 1972.* (8 references)

Positive identification of pesticide residues sometimes requires mass spectrometry in addition to gas chromatographic analysis. Since mirex and Kepone (chlordecone) elute from the gas chromatogram at the same time as some polychlorinated biphenyls, characteristic peak patterns for these two pesticides have to be identified. The isotopic abundance ratios for organochlorine compounds containing up to 12 chlorine atoms were calculated from the probability formula of Beynon and used to identify molecular and fragment ions in the mass spectra of Kepone and mirex. Strong peak clusters at *m/e* 270 were found in both spectra, corresponding to positively charged hexachlorocyclopentadiene and suggesting the retro-synthesis type of fragmentation also observed among the chlorinated cyclodiene pesticides. A second strong peak at *m/e* 235 resulted from loss of a chlorine from the fragment at 270. Kepone also presented a peak at *m/e* 216, showing that the charge is alternately localized in both halves of the base molecule. Ease of ring rupture in Kepone was also indicated. Using these peaks as well as the molecular ions (*m/e* 540 for mirex and *m/e* 486 for Kepone) provides a high degree of certainty in the identification of mirex and Kepone.

72-1561. Goerlitz, D. F.; Law, L. M. (Water Resources Div., U.S. Geological Survey, Menlo Park, CA 94025). **Chlorinated naphthalenes in pesticide analysis.** *Bull. Environ. Contam. Toxicol. 7(4): 243-251; 1972.* (8 references)

The physical and chemical properties as well as the uses of chlorinated naphthalenes are similar to those of the polychlorinated biphenyls. Five commercial chlorinated naphthalene mixtures (Halowaxes) were subjected to gas chromatography with an electron-capture detector, using Gas Chrom Q coated with 3% OV-101 or 5% OV-210. Using a computer-controlled gas chromatograph-mass spectrometer system, chlorine numbers were assigned to the GLC peaks. The chlorinated naphthalene chromatograms were not as characteristic of the formulation types as those for PCBs. Therefore, contamination with these substances cannot be as readily recognized by comparison with chromatograms of commercial standards. The insecticides lindane, heptachlor, aldrin, *p,p'*-DDE, *p,p'*-DDD (TDE) and *p,p'*-DDT elute close to major Cl_3, Cl_4, Cl_5, and Cl_6 chloronaphthalenes. In order to prevent interference by chlorinated naphthalenes in pesticide analysis, it may be necessary to remove the chloronaphthalenes beforehand, compare chromatograms obtained with two different detectors (e.g., electron-capture and microcoulometric), or use combined gas chromatography-mass spectrometry.

72-1562. Tong, S. C.; Gutenmann, W. H.; St. John, Jr., L. E.; Lisk, D. J. (Research and Development Labs., Corning Glass Works, Corning, NY 14830). **Determination of fluorine and bromine in halogenated herbicide residues in soil by spark source mass spectrometry.** *Anal. Chem. 44(6): 1069-1072; 1972.* (13 references)

Calibration curves were established in the range of 10 to 100 ppb fluorine for trifluralin and 1 to 1000 ppb bromine for bromacil and bromoxynil using spark source

mass spectrometry. Soil samples containing known amounts of herbicide were extracted with acetone, and extracts were partitioned in hexane, or evaporated and taken up in hexane. One method of preparation for analysis, involving addition of internal standard and graphite to the extract and evaporation of the hexane, utilized two graphite electrodes into which the sample-containing graphite was pressed. The second method, involving addition of internal standard, reduction of volume and addition of a very small amount of high-purity graphite, utilized flattened gold wire onto which the sample was placed drop by drop. Evaporation of the hexane left a very thin film of herbicide-graphite. Low levels of herbicide could be determined best by the second method, but precision was only ± 25 to 35%. The method is considered quite specific for pesticide compounds containing bromine or fluorine.

72-1563. Gordts, L. (Lab. of the Government Chemist, London, England). **De meervoudig gechloreerde bifenyls. [Polychlorinated biphenyls].** *Arch. Belg. Med. Soc. Hyg. Med. Trav. Med. Leg. 29(2): 98-112; 1971.* (75 references) (Flemish)

A review is presented of the physical and chemical properties of the polychlorinated biphenyls (PCBs), their occurrence in the environment and toxicology; the analytical methods for PCB detection are also discussed. The PCBs first attracted scientific interest as contaminants of extracts, analyzed for the presence of organochlorine insecticides. PCBs interfere in such analyses, since their gas chromatographic retention times are similar to those of many pesticides. In such extracts PCBs were identified as the contaminants by two-column gas chromatography, chlorine determination, mass spectrometry, and hydrolysis or nitration. PCB and organochlorine insecticides can be determined separately and quantitatively by first chromatographing the sample, then treating the purified sample extract with concentrated nitric acid at 0°C, extracting with hexane, and rechromatographing the resultant solution. In this manner, most of the organochlorine pesticides are retained in the aqueous phase, and most of the PCBs in the hexane. A more accurate separation is attained by passing the sample extract, after Florisil/aluminum oxide column cleanup, over a second column using silica gel as the adsorbent and hexane as the eluant. Quantitation using the electron-capture detector can be achieved by dividing the sum of peak height times retention time for all PCBs by peak height times retention time of *p,p'*-DDE on an Apiezon column.

72-1564. Devine, J. M.; Piedade, J. R.; Piedade, M. F. (Pesticide Analyses Section, Syracuse U. Research Corp., Syracuse, NY). **Sevin residue analysis in maple leaves.** *Arq. Inst. Biol., Sao Paulo 38(2): 63-67; 1971.* (1 reference)

A modified diazonium salt colorimetric method of Sevin (carbaryl) analysis was developed for determination of residues in maple leaves. Leaves were ground, extracted in chloroform in the presence of sodium sulfate, and, after filtration, re-extracted with chloroform. The combined extracts were evaporated to dryness and the residue was taken up in acetone and precipitated with ammonium chloride. Precipitation could be omitted in routine analyses. The slurry was filtered through diatomaceous earth and re-extracted with chloroform. A column of alumina and diatomaceous earth was used to remove chlorophyll. The chloroform eluate was evaporated, the residue was taken up in methanol and reacted with *p*-nitrobenzene diazonium fluoroborate, and absorbance was measured at 590 nm.

72-1565. Uete, T.; Miyamato, Y.; Ohnishi, M.; Shimano, N. (Kitano Hospital, Tazuke Kofukai Medical Research Inst., 3, Nishiogimachi, Kita-ku, Osaka City, Japan). **Spectrophotometric micromethod for measuring cholinesterase activity in serum or plasma.** *Clin. Chem. 18(5): 454-458; 1972.* (9 references)

A method for the determination of serum or plasma cholinesterase activity has been developed which is suitable for clinical and experimental studies. In a cuvet acetyl- or butyrylthiocholine is hydrolyzed by cholinesterase and the liberated thiocholine is reacted with 2,2'- or 4,4'-dithiodipyridine (PDS). The absorbance of the product, 2-thiopyridine or 4-thiopyridine, is measured at 343 nm or 324 nm, respectively, every minute for five to ten min against a blank. The absorbance of the 4-thiopyridine is about three times as great as that of 2-thiopyridine and, therefore, 4,4'-dithiodipyridine is the more sensitive reagent.

72-1566. McLeod, H. A.; Wales, P. J. (Dept. of National Health and Welfare, Food and Drug Directorate, Tunney's Pasture, Ottawa, Ont., Canada). **A low temperature cleanup procedure for pesticides and their metabolites in biological samples.** *J. Agr. Food Chem. 20(3): 624-627; 1972.* (13 references)

A low temperature cleanup procedure was developed to separate in one operation some polar and apolar pesticides from sample lipid, waxes, and water. Samples were extracted by refluxing with acetone-benzene (19 + 1) and extracts were cleaned up by low temperature precipitation at -78°C. A precipitation time of 30 min followed by filtration through Solka Floc (cellulose) was optimum. The water content of the extract did not adversely affect the recovery of polar residues but the presence of carbon in the filtration did. The cleaned-up extracts were suitable for GLC determination with electron capture and flame photometric detectors. Recoveries of thirteen representative insecticides, fungicides, and herbicides (captan, diazinon, dinitrobutyl phenol anisole, 2,4-D acid, 2,4-D isopropyl ester, endosulfan, malathion, malaoxon, parathion, paraoxon, phosphamidon, fenitro-

thion, and fenitroxon) ranged from 80 to 116% when added separately or in combination to samples of carrots, peas, wheat, human fat, liver, and kidney. (Author abstract reprinted by permission of the American Chemical Society)

72-1567. Kaufman, W. M.; Bills, D. D.; Hannan, E. J. (Dept. of Food Science and Technology, Oregon State U., Corvallis, OR 97331). **Identification of nanogram amounts of certain organochlorine insecticides.** *J. Agr. Food Chem. 20(3): 628-631; 1972.* (12 references)

Individual insecticides, eluting from a gas chromatographic column, were detected with an electron-capture and concurrently trapped in a Teflon capillary tube. Fifty microliters of solvent was added, and the trapped component was irradiated with ultraviolet (uv) light. Following irradiation periods of 15 to 120 sec, the contents of the Teflon tube were reinjected into the gas chromatograph and the uv-induced degradation pattern was noted. Characteristic "fingerprint" degradation patterns were obtained for nanogram quantities of heptachlor, heptachlor epoxide, aldrin, dieldrin, and the *p,p'* and *o,p'* isomers of DDT, DDE, and DDD (TDE). Analysis of a number of foods, soil, and osprey egg demonstrated the utility of the method to aid in the identification of the above insecticides in actual samples, even in the presence of coextracted materials or artifacts. The latter, which have retention times identical to those of certain insecticides, do not give the characteristic "fingerprint" degradation pattern of the insecticide upon irradiation. (Author abstract reprinted by permission of the American Chemical Society)

72-1568. Khalifa, S.; Mumma, R. O. (Pesticide Research Lab. and Graduate Study Center, Dept. of Entomology, The Pennsylvania State U., University Park, PA 16802). **Gas chromatographic separation of the aglycone metabolites of carbaryl.** *J. Agr. Food Chem. 20(3): 632-634; 1972.* (22 references)

Trifluoroacetyl, heptafluorobutyryl, and chloroacetyl derivatives of carbaryl and various aglycone metabolites (4-hydroxy-1-naphthyl *N*-methylcarbamate, 5-hydroxy-1-naphthyl *N*-methylcarbamate, 6-hydroxy-1-naphthyl *N*-methylcarbamate, 7-hydroxy-1-naphthyl *N*-methylcarbamate, and 1-naphthyl *N*-hydroxymethylcarbamate) were prepared and analyzed by gas-liquid chromatography (GLC). Derivatives of 1-naphthol and various naphthalenediols, resulting from basic hydrolysis of the aglycones, were also examined, including the chloromethyldimethylsilyl and trimethylsilyl derivatives. Trifluoroacetyl and heptafluorobutyryl derivatives of the carbamate aglycones were sufficiently thermally stable to be analyzed by GLC. The trifluoroacetyl derivatives of the carbamates were most desirable because of their ease of purification, their short retention time, and their high sensitivity to electron affinity detectors. Of the reagents evaluated, the chloromethyldimethylsilyl derivatives of the naphthalenediols gave the best separation on GLC. (Author abstract reprinted by permission of the American Chemical Society)

72-1569. Huston, B. L. (Research Labs., Food and Drug Directorate, Dept. of National Health and Welfare, Tunney's Pasture, Ottawa K1A OL2, Ont., Canada). **Identification of three neutral contaminants in production grade 2,4-D.** *J. Agr. Food Chem. 20(3): 724-727; 1972.* (9 references)

The structure of a major neutral contaminant in production grade 2,4-D is derived by chemical and spectroscopic data and confirmed by synthesis. Two other neutral impurities are tentatively identified and shown to be isomeric with the major neutral contaminant by combined GLC-mass spectroscopy. Evidence is presented to show that these impurities can interfere with the GLC analysis of 2,4-D for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin content. (Author abstract reprinted by permission of the American Chemical Society)

72-1570. Argauer, R. J.; Webb, R. E. (Entomology Research Div., Agricultural Research Service, U. S. Dept. of Agriculture, Beltsville, MD 20705). **Rapid fluorometric evaluation of the deposition and persistence of carbaryl in the presence of an adjuvant on bean and tomato leaves.** *J. Agr. Food Chem. 20(3): 732-734; 1972.* (5 references)

A rapid analytical procedure for determining carbaryl on the leaves of bean and tomato plants was developed and used to evaluate the effectiveness of an adjuvant, β-pinene polymer, in spray formulations. Small aliquots of methylene chloride extracts of treated leaves were placed into glass vials and the solvent was allowed to evaporate. Sodium hydroxide solution was then added to hydrolyze carbaryl into 1-naphthol, which is leached out into the clear aqueous solution for measurement of the fluorescence intensity. No significant difference was found in the initial deposit (~1000 ppm) or the chemical lifetime of carbaryl when the spray did or did not contain this adjuvant. The method may readily be applied to other studies with carbaryl. (Author abstract reprinted by permission of the American Chemical Society)

72-1571. Ercegovich, C. D.; Witkonton, S.; Steen, K. B. (Pesticide Research Lab. and Dept. of Entomology, The Pennsylvania State U., University Park, PA 16802). **An improved gas chromatographic method for the analysis of 5,6-dichloro-2-trifluoromethylbenzimidazole in soil.** *J. Agr. Food Chem. 20(3): 734-736; 1972.* (4 references)

An improved method was developed for the extraction of 5,6-dichloro-2-trifluoromethylbenzimidazole (NC-2983) from soil. This chemical is a major degradation product in the soil of the acaricide fenazaflor,

5,6-dichloro-1-phenoxycarbonyl-2-trifluoromethylbenzimidazole (Lovozal, fenazaflor). NC-2983 was extracted with a mixture of methylene chloride and isopropyl alcohol. Interfering soil materials were removed by means of alkaline saline washing of the organic phase. Electron-capture gas chromatography employing a 3% OV-17 column was used to determine the quantity of NC-2983 in the final sample preparations. This modified procedure is faster and simpler to perform than a more entailed acidic methanolic extraction procedure, but is equal to it in sensitivity and reliability. (Author abstract reprinted by permission of the American Chemical Society)

72-1572. Brenner, K. S.; Mueller, K.; Sattel, P. (Untersuchungslaboratorium der Badischen Anilin- und soda-Fabrik AG, 67 Ludwigshafen am Rhein, Germany). **Nachweis und Bestimmung von 2,3,7,8-Tetrachlordibenzo-*p*-dioxin in chlorsubstituierten Phenoxyalkansaeuren. [Detection and determination of 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin in chlorine-substituted phenoxyalkanoic acids.]** *J. Chromatogr. 64(1): 39-48; 1972.* (18 references) (German)

2,3,7,8-Tetrachloro-dibenzo-*p*-dioxin (dioxin) may be separated from the phenoxyalkanoic acid herbicides by extractive distillation of their potassium salts with *n*-hexane in the Bleidner apparatus. These chlorinated compounds and the hexane are heated in separate flasks, their vapors mixing in the glass tubing pathway of the apparatus. The two vapor streams co-condense, and the solvent mixture formed separates into two layers in the lower portion of the apparatus. The hexane layer, containing the dioxins, flows back into the hexane flask, and the water into the water flask. As much as 50 g of phenoxyalkanoic acid can be extracted in this manner if a 500-ml water flask is used. Since the resulting extract still contains interfering components, a column with good separating power must be used in the GLC analysis. A 60-m stainless steel capillary column coated with Dexsil ®, a new carboranesiloxane, combined with a flame ionization detector permits detection of 0.01 ppm of dioxins in 10 g of herbicide. With this column, a rapid test for dioxin contamination down to 1 ppm can also be performed on the methyl esters of the phenoxyalkanoic acids.

72-1573. Frei, R. W.; Lawrence, J. F. (Dept. of Chemistry, Dalhousie U., Halifax, Nova Scotia, Canada). **Fluorigenic labelling of carbamates with dansyl chloride. IV. *In situ* quantitation of *N*-methylcarbamate insecticides on thin-layer chromatograms.** *J. Chromatogr. 67(1): 87-95; 1972.* (11 references)

The quantitative analysis of a number of *N*-methyl carbamate insecticides by thin-layer chromatography and *in situ* fluorometry of their dansyl derivatives was investigated. Statistical analysis indicated a relative standard deviation of 4.5% for concentrations ranging from 5 to 500 ng per spot of carbamate. Calibration curves (peak area *versus* concentration) were linear up to 300 to 400 ng per spot and generally exhibited an increase in slope with time, due to an increase in fluorescence of the spots. Analyses were performed on spiked water samples. Mesurol (methiocarb) and Landrin were simultaneously extracted and reacted with dansyl chloride, after which the resulting dansyl-phenol derivatives were analysed quantitatively following spearation on Silica Gel G-silver oxide layers with benzene-acetone (98:2). Baygon (aprocarb), Mesurol and Landrin were simultaneously extracted from water samples and determined as total *N*-methyl carbamate by measuring the fluorescence of the dansyl-methylamine derivatives. Recoveries from the samples extended from 90 to 106% at concentrations in the low p.p.b. range. The method offers improved specificity over existing techniques because two derivatives are formed with each carbamate, both of which can yield quantitative results. (Author abstract by permission, edited)

72-1574. Holmes, D. C.; Wood, N. F. (Lab. of the Government Chemist, Cornwall House, London, S.E.1, Great Britain). **Removal of interfering substances from vegetable extracts prior to the determination of organochlorine pesticide residues.** *J. Chromatogr. 67(1): 173-174; 1972.* (8 references)

Carrots, onions and *Cruciferae* such as radish, white cabbage and turnip contain carotenoids and organic sulfides which can interfere in chromatographic (GLC or TLC) examinations for organochlorine pesticide residues. To remove these compounds, the primary cleaned-up sample extract is passed over a column containing prepared alumina. The alumina is prepared by dissolving 0.75 g of silver nitrate in 0.7 ml of water, warming and adding 4 ml of acetone, then mixing with 10 g of alumina. After evaporation of the acetone, 1.0 g of the alumina is placed in a glass chromatographic column containing 5 ml of *n*-hexane, and the surplus hexane run off. The sample extract, concentrated to 1 ml in *n*-hexane, is placed on the column, then eluted with 10 ml of *n*-hexane. Carotenes present in the sample remain on the column as a narrow, reddish band, and sulfur compounds as a black band. All of the common organochlorine pesticides pass through this column unchanged, except for heptachlor, which forms a derivative with a retention time similar to that of aldrin on some GLC columns. If convenient, the prepared alumina may also be placed at the bottom of the primary sample cleanup column.

72-1575. Geike, F. (Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Institut fuer Pflanzenschutzmittelforschung, D 1 Berlin 33, Germany, BRD). **Duennschichtchromatographisch - enzymatischer Nachweis einiger Lindan- und theoretisch moeglicher DDT-Metaboliten sowie von Pentachlorphenol. [Thin-layer**

chromatographic-enzymatic identification of some lindane- and possible DDT-metabolites as well as pentachlorophenol.] *J. Chromatogr. 67(2): 343-349; 1972.* (16 references) (German)

The possibility of identifying *p*-chlorobenzaldehyde, *p*-chlorobenzoic acid, benzophenone, chlorobenzene, benzoic acid, pentachlorophenol (PCP), 1,2,4,5-tetrachlorobenzene, 1,2,3-trichlorobenzene, and 1,2,4-trichlorobenzene by their inhibition of the enzymes bovine liver esterase, trypsin, acid and alkaline phosphatase, α- and β-amylase on thin-layer plates was studied. Pentachlorophenol was a very strong inhibitor of all the enzymes studied and can be detected in the range of 10 ng with bovine liver esterase to 3 μg with α-amylase. Benzophenone, however, showed strong inhibitory activity only against the phosphatases, while the other enzymes were only moderately inhibited. Chlorobenzene could not be identified by inhibition of any of the enzymes by this technique. The other substances studied show a very different behavior and often were only inhibitory after UV irradiation. (Author abstract by permission)

72-1576. Takeo, T.; Shibuya, M. (National Research Inst. of Tea, Kanaya-Cho, Shizuoka, Japan). **[Determination of arsenic in tea plant by neutron activation analysis.]** *Nippon Shokuhin Kogyo Gakkai-Shi (J. Food Sci. Technol. (Tokyo)) 19(2): 91-95; 1972.* (8 references) (Japanese)

A method for determination of arsenic in tea plant parts by neutron activation analysis was developed. Arsenic could not be determined by non-destructive activation analysis using the Ge(Li) γ-ray spectrometer, since the γ-ray peak of ^{76}As on the spectrogram is masked by the γ-ray peak of ^{82}Br which is present in tea and has a very similar γ-ray spectrum. After destruction of the tea plant with acid, the Br present in the solution was distilled off and the γ-ray peak of ^{76}As was detected on the γ-ray spectrum of the acid-digested solution. Quantitative determination is possible using this peak for contents above 0.2 μg As. Arsenic in tea plants was separated from other components by the Gutzeit method, and two characteristic γ-ray peaks of ^{76}As found on the γ-ray spectrogram. Contents in the tea plant of more than 0.05 μg As can be determined quantitatively by this technique.

72-1577. Sydymanov, B. B. (Kiev Inst. of Postgraduate Training of Physicians, Kiev, USSR). **Pro mozhlyvist' vykorystannya metodu khromatohrafiyi v tonkomu shari z metoyu vyyavlennya fosfamidu v trupnomu materiali. [On the possibility of utilizing thin-layer chromatography for the detection of phosphamide in cadaver material.]** *Farm. Zh. (Kiev) 26: 50-52; 1971.* (9 references) (Ukrainian)

A method was developed for the determination of phosphamide (dimethoate) in cadavers by thin-layer chromatography. Rats were given twice the LD50 (470 mg/kg) of the compound. The animals died within three to four hr and samples taken from various organs were extracted three times with distilled water (pH 4 to 5) and then with chloroform. The chloroform extracts were dried with anhydrous sodium sulfate and evaporated to 0.5 ml on a water bath at 40 to 50°C. Chromatoplates were prepared from a suspension of 40 g silica gel and 1.0 g calcium sulfate in 110 ml distilled water. The solvent system, benzene:acetone (3:2), was allowed to travel to a 10 cm front line. It was then dried and the color developed with a diazotized sulfanilic acid reagent containing a 15% KI solution. A yellow spot which developed within three to five min. (*Rf* 0.7 to 0.85) corresponded to phosphamide and a red spot (*Rf* 0.3 to 0.45) corresponded to a phosphamide metabolite referred to as the PO analog. Quantitation was made by visual comparison with known standards. Carbofos (malathion) also reacted with the reagent but did not interfere with the determination because it traveled with the solvent front. Other organophosphates such as methyl mercaptophos and chlorofos (trichlorfon) did not react with the sulfanilic acid reagent. The method was sensitive to 2.0 to 5.0 μg of phosphamide per sample. This technique is recommended for forensic medical use.

72-1578. Weber, K. (Zavod za Sudsku Medicinu i Kriminalistiku Medicinskog Fakulteta, Zagreb, Yugoslavia). **Opticke metode u detekciji otrova. [Optical methods for detecting poisons.]** *Arch. Hig. Rada Toksikol. 21(3): 271-282; 1970.* (18 references) (Croatian)

Optical methods for detection and quantitative determination of poisons, reviewed in this article, include spectrographic, spectrophotometric, and luminometric (fluorescence, chemiluminescence) methods. Emission spectral analysis is useful in the detection of metallic poisons. For quantitative determination, better results in atomic absorption spectrometry can be obtained by using heated graphite tubes as sample carriers. Direct spectrophotometric and luminometric measurement of toxicologic sample solutions generally fails to offer the required degree of specificity and sensitivity. Better results are obtained by employing optical methods which follow catalytic reactions in which the poison plays the role of a catalyst. Examples include: the determination of insecticidal phosphate esters and carbamates via the oxidation reactions of benzidine and *o*-dianisidine (spectrophotometric method), via the oxidation reaction of indol (fluorometric method) and via the chemiluminescence of luminol (luminometric method). One essential point is that such methods respond only to toxicologically active material, not to materials which have already lost their activity due to chemical change.

72-1579. McCully, K. A. (Food and Drug Directorate, Dept. of National Health and Welfare, Ottawa, Ontario,

Canada KlA OL2). **Report on phosphated pesticides.** *J. Ass. Offic. Anal. Chem. 55(2): 291-297; 1972.* (62 references)

In the opinion of the AOAC General Referee for organophosphate pesticides, progress in the development of analytical methodology for these substances has been much too slow. Because of the large number of organophosphate pesticides available and the possibility of simultaneous contamination by two or more of these, multiresidue methodology with confirmation procedures is required. The general pesticide residue method has official first action status for 7 organophosphates, including parathion, in 18 crops. The sweep codistillation cleanup is official first action for 6 of these compounds in 7 crops; validation studies are underway. In general, columns based on adsorbed mixtures containing carbon are more suitable for cleanup of sample extracts containing organophosphates than all-Florisil columns. Alumina and silica gel have also been studied as adsorbents for the cleanup of such extracts, but have not proven entirely satisfactory. With the advent of more sensitive and specific GLC detectors, procedures requiring minimum cleanup (e.g., liquid-liquid partition) have become more prevalent. Reorganization of the Associate Refereeships to cover broad methodological areas rather than specific compound analyses, is proposed.

72-1580. Koons, J. R.; Day, Jr., E. W. (Eli Lilly and Company, Greenfield Labs., Greenfield, IN 46140). **Separation of benefin and trifluralin by gas chromatography.** *J. Chromatogr. Sci. 10(3): 176-178; 1972.* (4 references)

A gas chromatographic procedure was developed with which benefin and trifluralin could be separated in mixtures ranging from 7:3 to 3:7. In mixtures of 10:1 and 1:10 reasonable quantitation was possible on the larger component. The method employed a 6 ft by 2 mm glass column packed with Durapak-Carbowax 400/Poracil C 100/200 mesh. Although the best separation was achieved at 195°, column life was prolonged if 175° was used and the column was cooled to 120° at night. Soil extracts were successfully assayed by this method.

72-1581. Menandez, M. I.; Clemente, A. E.; Dabrio, M. V. (Instituto de Quimica Organica General, Madrid, Spain). **Columnas capilares en el analisis de plaguicidas organoclorados por chromatografia de gases. [Capillary columns applied in gas chromatographic analysis of organochlorine pesticides.]** *Rev. Agroquim. Tech. Aliment. 12(1): 96-105; 1972.* (10 references) (Spanish)

Optimum conditions for the separation of organochlorine pesticides and some of their metabolites by means of gas chromatography were studied. A Carlo Erba chromatograph provided with a Perkin Elmer electron-capture detector was used with various classical and capillary glass columns. Stationary phases included silicone oil, silicone rubber, Carbowax-20M or Apiezon L. The relative retention time varied with temperature in the case of aldrin on each of the above stationary phases. Carbowax-20M and Apiezon L were the most selective of the polar phases, allowing complete separation of all the above organochlorines at 170°C. Combination of these two phases and the utilization of an open capillary glass column provided stationary phases with two different polarities and enhanced the separating power. The electron-capture detector followed Beer's optical absorption law, and a diagram is presented of electron absorption coefficients for aldrin as affected by the background current at 180°C with argon-methane 19:1 as a gas carrier. The efficiency of the capillary glass column appeared to be 10 times better than that of the classical column.

72-1582. Ikramov, L. T.; Tashpulatov, A. Yu. (Tashkent Inst. Pharmaceutics, Tashkent, USSR). **Izolirovaniye i opredeleniye sayfosa pri issledovanii biologicheskogo ob"yekta. [Isolation and determination of sayfos in biological materials.]** *Sud. Med. Ekspertiza 14(3): 35-37; 1971.* (Russian)

Optimum extraction conditions for sayfos (menazon) from biological specimens (forensic medicine) were studied. Procedures compared included steam distillation, utilization of acidified water or acidified alcohol, and infusion with various organic solvents such as ethyl ether, chloroform, dichloroethane, benzene, toluene or petroleum ether. No menazon extraction was achieved by steam distillation, and the modified procedures utilizing acidified alcohol or water produced yields with poor reproducibility. Ethyl ether appeared to be the most appropriate solvent for the infusion procedure, yielding 25.5% extraction upon one hour shaking of a 100 g. biological material sample and 64% extraction upon four-fold infusion with fresh solvent aliquots (100 ml each) at an optimized pH of 5.0. The ethyl ether extract was then filtered and evaporated to dryness on a water bath. The residue was digested with 3 ml of conc. sulfuric acid and 10 ml of conc. nitric acid in a Kjeldahl apparatus. The digested material was made up to 100 ml with dist water. Aliquots were taken and treated with a reducing mixture, including metol, sodium sulfite and sodium bisulfite, and with a 5% ammonium molybdate solution in 10*N* sulfuric acid. Ten min later a 34% solution of sodium acetate was added and the mixture made up to a definite volume with dist. water. Color intensity was determined on a colorimeter using a red filter and a 1 cm light path.

72-1583. Hayamizu, K.; Yamamoto, O.; Kushida, K.; Satoh, S. (Government Chemical Industrial Research Inst., 1-1-5, Honmachi, Shibuyaku, Tokyo, Japan). **Nuclear magnetic resonance spectra of five isomers of 1,2,3,4,5,6-hexachlorocyclohexane.** *Tetrahedron 28(3): 779-790; 1972.* (15 references)

Analysis

Five isomers of 1,2,3,4,5,6-hexachlorocyclohexane (BHC) were studied using NMR spectrometry. Some correlations were found between the spin coupling constants and the chlorine atom configuration, which were interpreted by the small changes in dihedral angle due to ring distortion and the conformational dependence of the electronegative substituents with respect to the coupled protons. The magnetic anisotropy effect of C-Cl bonds on the proton chemical shifts was investigated. It was found that the anisotropy effect, even after elimination of solvent, cannot explain all of the proton shifts in BHC isomers. ^{13}C chemical shifts from internal TMS were also observed.

See also **72-1385** **72-1398** **72-1399** **72-1416** **72-1508**

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